JAPANESE IMMIGRANT AGROFORESTRY
IN THE BRAZILIAN AMAZON:
A CASE STUDY OF SUSTAINABLE RURAL DEVELOPMENT
IN THE TROPICS

By

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Dedicated to Elma Yukari Tsukimata Yamada, my daughter, born in Gainesville, Florida, U.S.A. in 1997; Helena Sayuri (Tsukimata) Yamada, Elma's mother and a physician, born at Tomé-Açu, Pará, Brazil in 1966; Ikuko (Ishikawa) Tsukimata, Helena's mother born in Palau Island, today's Republic of Belau, in 1938 and arrived at Tomé-Açu in 1956; Shin'ichirō Tsukimata, Helena's father and a farmer born at Tomé-Açu in 1936 and murdered by robbers at Abaetetuba, Pará in 1984; Yutaka Tsukimata, Shin'ichirō's father and a farmer, born in Fukuoka Prefecture, Japan in 1909, arrived at Tomé-Açu in 1930, and died there of malaria in 1939; the Tokuda family who raised the orphaned Shin'ichirō; the Ishikawa family who raised the orphaned Ikuko; and all relatives and friends of these people, dead or alive, who made their way from distant lands, filled with dreams of a better life, and struggled for survival in the Amazon rain forest.

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JAPANESE IMMIGRANT AGROFORESTRY IN THE BRAZILIAN AMAZON: A CASE STUDY OF SUSTAINABLE RURAL DEVELOPMENT IN THE TROPICS

By

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This research focuses on the Brazilian Amazon and details of the agricultural practices (including livestock breeding and agroforestry) of a group of farmers of Japanese descent there. Their 90-year history is reviewed in the context of international economy and politics. Collective self-support strategies of the immigrants in the interior, and assistance from the Brazilian and Japanese governments are discussed. The course of identifying suitable crops to local soil and climate, and the process of farm diversification and agroforestry development is examined. Future prospects for their agriculture are discussed.

The literature survey was conducted in the US, Japan, and Brazil (in São Paulo and the Amazon), from 1992 through 1998. Field research was done during May-June 1993, and

December 1994-January 1997. The case study site was selected at the municipality of Tomé-Açu, seat of the largest and second oldest Japanese settlement in the Amazon.

The entire Japanese-Brazilian population at Tomé-Açu (1.5 thousand) was surveyed to determine socioeconomic characteristics and land use (78,500 ha). Crops were inventoried at each farm for age, number, area, and cultivation method. The representative Japanese-Brazilian farming systems involving açai, acerola, black pepper, cacao, cupuaçu, passion fruit, pasture, rubber tree, and timber tree species were studied by one-year financial record keeping of 29 fields.

Crop systems were found to be more efficient, in terms of income generation and natural resources conservation, than the recently expanding pasture system. Ten to twenty hectares of crop fields and some hundred to more than a thousand hectares of pastures generated similar incomes. Crop farms provided more rural employment per area, especially for women and minors, compared to ranches. Agroforestry seemed an economically viable and ecologically preferable alternative to ranching. However, there were yet various causes inhibiting its development.

The experience of Japanese immigrants in the Amazon offers lessons for sustainable rural development of the Amazon region, and the humid tropics of the world.

CHAPTER 1
INTRODUCTION

Japanese immigration to South America began during the early 20th century. The principal destination was Brazil, particularly São Paulo and its neighboring states. A modest number of Japanese also settled in the Amazon Basin, where they established two important regional commercial crops, jute (*Corchorus capsularis*) and black pepper (*Piper nigrum*). Three generations of farming in the tropics endowed the settlers and their offspring with lessons in adapting traditional skills to local ecological conditions. From a base of oriental agriculture, they created a new model for sustainable farm production, intensively managed agroforestry (Subler and Uhl 1990).

A number of researchers from Brazil, the US, and Europe have investigated Tomé-Açu, Pará, the largest and second oldest Japanese settlement in the Amazon, to extract useful lessons that might serve as a basis for successful rural development. My interest in Japanese immigrants was spurred by this literature, which was not well known in Japanese academic circles. Living deep in the neotropical forests of

the Amazon, these expatriates have become almost forgotten in their homeland. Tomé-Açu, itself, is best known for its black pepper. Before the arrival of foreign researchers, few Japanese scholars dared to associate local Japanese-Brazilians (***Nipo-Brasileiros***) to the currently popular notion of 'sustainable development.'

Soon after arriving in Gainesville, Florida in the autumn of 1992, I had the opportunity to meet with Dr. Christopher Uhl of Pennsylvania State University. He had been asked to present a lecture by the Tropical Conservation and Development (TCD) Program of the University of Florida. He also knew my research advisor, Dr. Henry L. Gholz. Dr. Uhl had surveyed Tomé-Açu and other Japanese settlements in the Amazon with a graduate student, Dr. Scott Subler. Subsequently, Dr. Gholz sent me to meet Dr. Subler at Ohio State University in Columbus. I received great help and encouragement from these researchers in formulating a field research proposal.

A preliminary field survey in Brazil was conducted during May-June 1993, in Belém and Tomé-Açu, in the Brazilian State of Pará. I then undertook documentation surveys in Tōkyō in both August and November of 1994. Actual field work in Brazil began in December 1994, and continued until January of 1997. The first month was spent

doing research in libraries in São Paulo City. During the second month I made field visits to Japanese settlements where agroforestry was being practiced in the Brazilian tropics: Una, Ituberá, and Taperoa in Bahia; Manaus in Amazonas; and Monte Alegre in Pará. From February 1995 to January 1997, I stayed mostly at Tomé-Açu, Pará, except for occasional visits to Belém, the state's capital.

This dissertation addresses the following questions about these Japanese immigrants and their agricultural practices (including livestock breeding and agroforestry):

1) Why and how did Japanese farmers come to Brazil, and then enter the Amazon Basin?

2) How did they adapt themselves to an unfamiliar environment, and then develop unique production systems?

3) What is the current state of Japanese-Brazilian agriculture in the Amazon, and its future prospects?

During the course of human history, emigration has occurred when people seek refuge from hardships at home, and better chances of economic success abroad. However, immigrants are initially handicapped by limited knowledge about the host society and a lack of capital resources. Under such circumstances, immigrants have few options other than making best use of skills brought from their homeland. Farming therefore became the primary activity of Japanese immigrants in the Amazon, and the focus of this research. Intensive agricultural practices have developed in Japan due

to historical limitations in the extent of arable land there. The multipurpose agricultural cooperatives used by Japanese also have their roots in rural community institutions from the homeland.

Japanese farmers in the Americas successfully modified traditional forms of agricultural production to suit their new environment. Their unique skills in cropping and cooperative management provided them socioeconomic niches within the host society. Nevertheless, their cultural and philosophical values expressed through farming, the backbone of their practices, are not immune to acculturation. This particularly applies to the descendants of immigrants, who have been educated in the mainstream culture of the host society. For example, it is difficult for those raised in the Amazon to imagine what lies behind the agricultural practices of their parents. In their new home, human resources restrict productivity more than land resources do. Hence, depending on relative profitability considerations, descendants of Japanese immigrants could be attracted to extensive systems.

Today, timber extraction and large-scale pasture development in the Brazilian Amazon are a global concern. Because of this concern, the land-saving production technologies of Japanese-Brazilian farmers are receiving attention as alternatives to mass deforestation, and as

guides toward more sustainable rural development. Therefore, the overarching focus of this research is the evolutionary process of this immigrant agriculture, and whether it has potential to modify or replace the extensive production strategies currently prevailing in the Amazon.

Chapter 2 presents the history of Japanese immigration to the western hemisphere, and particularly to Brazil. The arrival of the Portuguese in Japan during the 16th century set in motion the first emigration event out of the island nation, followed by national seclusion and isolation during the 17th through 19th centuries. Japanese national isolation ended with the opening of Japanese ports by the United States in the mid-19th century, which in turn triggered the decline of the Shogunate regime, and a second wave of Japanese emigration to Hawaii and the US West Coast. Chapter 2 depicts how Japanese contract plantation workers contributed to the local economy, developed into independent horticulturists, and their fate. A US policy change that blocked Asian immigration to the US in the early 20th century turned Brazil into the primary destination for Japanese contract plantation workers. The final focus of this chapter is on Japanese farm establishment in Brazil, the introduction of multipurpose agricultural cooperatives there, and the development of new crops and cultivation technologies previously unknown in Brazil. Chapter 2 closes

by providing the background for Japanese immigration to the Amazon, which is discussed in more detail in Chapter 3. Several resources were used repeatedly as general references, without citing them each time they were used. Much of the information presented is accepted as historical fact in Japan and Brazil, and among Japanese-Brazilians themselves. These frequently-cited resources include:

1) Brazil Nihon Imin Hachijūnenshi Hensan Iinkai. 1991. Brazil Nihon Imin Hachijūnen-shi (The 80-year History of Japanese Immigration to Brazil). 452p. Imin Hachijūnen-sai Saiten Iinkai/Brazil Nihon Bunka Kyōkai, São Paulo, Brazil.

2) Comissão de Elaboração da História dos 80 Anos da Imigração Japonesa no Brasil. 1992. Uma Epopéia Moderna - 80 Anos da Imigração Japonesa no Brasil (A Modern Epic - 80 Years of Japanese Immigration to Brazil). 605p. Editora Hucitec/Sociedade Brasileira de Cultura Japonesa, São Paulo, Brazil.

3) São Paulo Jinmon Kagaku Kenkyūjo etd. 1996. Brazil Nihon Imin, Nikkei Shakai-shi Nenpyō - Handa Tomoo Hencho Kaitei Zōho Ban (Chronology of Japanese Immigration, and Japanese-Brazilian Society - Enlarged and Revised Edition of Tomoo Handa's Chronology). 357p. São Paulo Jinmon Kagaku Kenkyūjo, São Paulo, Brazil.

4) Kōdansha. 1993. JAPAN - An Illustrated Encyclopedia. xxxvi. 1924p. Kōdansha, Tōkyō, Japan.

5) Kokushi Daijiten Henshū Iinkai 1979-93. Kokushi Daijiten (Great Encyclopedia of Japanese History). volumes 1-14. Yoshikawa Kōbunkan, Tōkyō, Japan.

While US anti-Asian immigration policies were considered for adoption by the southern states of Brazil, the Amazon region experienced a severe economic depression, caused mainly by Britain's establishment of rubber

plantations in Southeast Asia, and the consequent collapse of the forest-rubber market in Brazil. The states of Pará and Amazonas therefore solicited foreign governments for agricultural development assistance, offering large blocks of concessional lands as incentives. Thus, Japan's interest in providing new farming opportunities to her people led to the first Amazonian settlement in 1928. It also happened to be the year when US national interest in having its own source of latex led to the establishment of the Ford rubber-tree plantation program in the Tapajós River Basin.

Chapter 3 reviews the development of Japanese settlement projects in Amazônia, including crop selection and application, and the early unfavorable results. Hardships of Japanese immigrants, 'deserted' by their homeland during World War II, and their achievements in developing jute and black pepper cultivation are discussed. These successes permitted the resumption of Japanese immigration to Brazil in the 1950s. Post-World War II Amazon settlement projects involving a new generation of Japanese immigrants are then described. The final portion of Chapter 3 focuses on the economic success of Tomé-Açu as the black pepper production center of the Americas in the 1950s-1960s. However, rapid expansion of monoculture led to an outbreak of plant disease and large scale collapse of black pepper. The course of the farmers' readjustments to

this new situation is described, leading up to the present. Agroforestry was found to be a feasible option in this readjustment process.

In Chapter 3, the birth-death dates and professional titles of individuals associated with Japanese settlement of the Amazon were obtained from printed documents and personal correspondence. Sources for this information about local historical figures, while not cited each time they are used in the text, include:

1) Cruz, E. 1973. História do Pará (History of Pará). 782p. Governo do Estado do Pará, Belém, Brazil.

2) Bittencourt, A. 1973. Dicionário Amazonense de Biografias - Vultos do Passado (Amazonas Dictionary of Biography - Important Figures of The Past). 517p. Editora Conquista, Rio de Janeiro, Brazil.

Chapter 4 first traces the origins of intensive farming in East Asia, tree planting, and agroforestry practices in Japan. The roles of master farmers like *Rōnō* and *Tokunō* are discussed in light of Japan's agricultural development. Modern rural leadership training and cooperative education, inspired by modern Danish initiatives and traditional Japanese community morals, are reviewed.

The latter half of Chapter 4 describes crop diversification and agroforestry as developed by Japanese immigrants in the Amazon. Early efforts of the Japanese Plantation Company of Brazil Corp. (***Companhia Nipônica de***

Plantação do Brasil S.A.) and other groups are discussed. The post-World War II farm planning of immigrant leaders concerning sustainable agriculture is reviewed. In point of fact, farmers had been informed by their leaders of the risks associated with monoculture. However, profits from black pepper culture became so lucrative as to blind them from such risks (Sakaguchi 1997).

The *Fusarium* outbreak and its consequences are summarized. Different levels of institutional integration and their effects on agricultural practices are discussed, including individual homegarden trials, cooperative field experiments, and public research institutes like the Amazon Tropical Agriculture Experiment Institute (***INATAM*** [***Instituto Experimental Agrícola Tropical da Amazônia***]). Finally, both individual and joint agroforestry and reforestation initiatives initiated by Japanese immigrants in the Amazon are reviewed.

Chapter 5 describes the current state of agriculture at Tomé-Açu through the presentation of a comprehensive community survey, conducted during 1995 and 1996. The survey was supported by both the Tomé-Açu Agricultural Promotion Association (***ASFATA*** [***Associação Fomento Agrícola de Tomé-Açu***]) and the Tomé-Açu Multipurpose Agricultural Cooperative (***CAMTA*** [***Cooperativa Agrícola Mista de Tomé-***

Açu]). It includes village demographic data, land holding and land use information, the extent of cropped areas, year of planting, and planting methods. Nine representative crops from the village were chosen for economic study over one year. Weekly records were kept of inputs and outputs for 29 cases. Limited availability of cooperating farms and variation in cultural treatments made statistical analysis of individual crops tenuous. However, the general trends of graphed data are apparent. For estimating farmers' annual yields from planted timber species, tree diameter at breast height (DBH) and canopy height were randomly measured throughout the settlement. Individual tree ages were obtained from their owners. Official unit timber prices were multiplied by mean annual unit growth to calculate annual economic yields. Above-ground biomass was also estimated for each crop through field measurements, applying procedures used by Subler (1993). These results, combined with the economic analyses, suggest what the future agricultural landscape of the Tomé-Açu will be. Conditions that might modify the predicted course of agricultural change are also discussed.

Chapter 6 summarizes this study by citing constraints to achieving stable agricultural production under current local conditions. Future research needed to address these

issues are listed. The potential role of Japanese-Brazilians in sound rural development of the Amazon is assessed. Chapter 7 provides a brief overall synthesis and reflections of this author.

Finally, readers should be aware that citations placed within brackets [] at the end of each section or paragraph apply to the entire preceding section or paragraph. This was done when the general description of, or discussion about the preceding subject relied on a classic treatise, or other sources cited. References for specific information are, however, indicated within parentheses () at the end of the sentence to which they refer.

Except for the names of individuals, plants and places, or citations, Portuguese and Spanish languages are shown by ***bold italic*** letters, while Japanese and Chinese words are listed by *italic* letters. Japanese words are alphabetized by the Hepburn System of *Rōma-ji*. However, adopted words from Western languages since the Meiji Era (see Chapter 2) are left in their original forms, such as 'home' and 'club' (actually '*hōmu*' and '*kurabu*' by *Rōma-ji*). Chinese alphabetization is based on official Beijing notation.

The currency exchange rates of Japanese yen (¥) to US dollars (US$) are shown in Appendix M. It was difficult to find reliable quotations for Brazilian currencies. Brazil

historically maintained complex foreign exchange systems and inflationary policies. Rough estimates are based on Izumi and Saitō (1954) and other documents citing current prices of each period.

Throughout the text, the words 'Japanese immigrant(s)' indicate those born in Japan (*issei* = first generation), either immigrated as adult(s) or child(ren). Child immigrants are called '*jun-nisei*' (semi-second generation) in the social science literature. Permanent Brazilian residents of Japanese descent and their direct family members (i.e., spouse, children, grandchildren, great-grandchildren, etc.), whether Brazilian or Japanese and without regard to generation (i.e., *issei*, *nisei*, *sansei*, *yonsei*, etc.), are all categorized as Japanese-Brazilians (***Nipo-Brasileiros*** = *Nikkei Brazil-jin*). Rural producers who belong to this category are mentioned as 'Japanese-Brazilian' farmers and ranchers, while others are noted as 'Brazilian' farmers and ranchers. 'Farmer(s)' are those engaged in crop farming and agroforestry. They occasionally own pastures to feed animals. However, the word 'rancher(s)' in my study is used only for those having at least several hundred hectares of pastures (i.e., owning several hundred head of cattle).

CHAPTER 2
JAPANESE IMMIGRATION TO BRAZIL

Introduction

This chapter reviews the course of Japanese emigration. Its origin, and the exodus after the arrival of Western explorers in the 16th century are briefly discussed. Japan subsequently closed the country (1639-1854), until it was forced to open by Westerners. Disruption of domestic economy followed through the rapid modernization of Japan. Mass emigration resumed for farm employment in Hawaii, in the US West Coast, and finally in Brazil. The conditions of Japanese immigrant farmers overseas, and their contributions to host societies are discussed, with a focus on Brazil.

Portuguese Exploration of Asia and the First Japanese Emigration

The Mongol Empire (1206-1368), with its territorial ambitions, brought fear to both Occident and the Orient. In the east, Mongols attempted to subdue all Asian kingdoms. Emperor Kublai Khan (1215-94), the presumed patron of Marco Polo (c1254-1324), commanded an army that led Korean and Chinese navies in raids of Japan's Kyūshū Island in 1274 and

1281 (*Genkō*). In his travels, Marco Polo described Japan of this period as 'the country of gold and treasure.' The two raids occurred during the reign of the Kamakura Shogunate (*Kamakura Bakufu*; 1192-1333), the first *samurai* administration of Japan to assert control over aristcrats at the Court (*Chōtei*) of the Emperor (*Mikado* or *Tennō*) in Kyōto. By chance, the Devine Storm (*Kamikaze*) typhoons destroyed the invading warships crewed by 25,000 men during the first attack, and 140,000 during the second.

Regional tensions between the continent and the archipelago resulting from these events forced private traders called Japanese Vikings (*Wakō*) to sea, seeking goods previously imported to Japan from China and Korea. When negotiations were not satisfactory, such traders turned themselves to pirates. *Wakō* were ubiquitous in the East and South China Seas to the end of the 16th century, annexing to them Chinese, Korean, Portuguese and Southeast Asian ships and crews. From the 14th century onwards, however, powerful Japanese traders, including *samurai* lords, acquired licences from the Japanese central authority to conduct official trade with the Chinese Ming dynasty (1368-1644).

Japan experienced an era of feudal *samurai* civil war from 1467 to 1615. In 1543, the first Portuguese drifted to Japan after being shipwrecked on a small island near Kyūshū

called Tanegashima. The lord of the island at once took note of their harquebuses (matchlock muskets). Some years later these arms were being manufactured within Japan, with improved designs. Firearms soon became more prevalent in Japan than in contemporary Europe, and that accelerated reunification of the country (Reischauer 1989).

After being 'discovered' by Europeans, Japan received frequent visits from Iberian traders along its southwest coast. Local *samurai* lords (*daimyō*) who controlled sea ports competed in trade for the precious exotic items brought by European vessels. This lucrative trade made a *daimyō* influential enough to survive the politics of Japan's protracted civil war.

The Iberian traders stipulated that these *samurai* lords protect Catholic missionaries posted within their domains as an essential condition to trade. Within 50 years after Francisco Xavier's (1506-52) visit to Japan between 1549 and 1551, Catholicism had been espoused by 700,000 Japanese throughout the country. This was due to the excellence and dedication of the missionaries, but also because of the Japanese attraction to new European technology. Jesuits brought zincography to publish the first romanized Japanese books, including Catholic doctrinal works, Japanese and European histories and novels, and pioneering Latin-

Portuguese-Japanese dictionaries. These works not only aided the dissemination of Catholicism in Japan, but also established a basis for mutual understanding between Europeans and the Japanese thereafter. Portuguese shipbuilding and sailing technology enabled Japanese to venture into the Southeast Asian seas by the end of 16th century.

Among powerful *samurai* lords of that epoch, Ieyasu Tokugawa (1542-1616) at Edo (now Tōkyō) subdued others and in 1603 was appointed *Shōgun* (or 'Tycoon' in popular English) by the then mythological authority of the Court of Emperor. The Shogunate (*Edo Bakufu*) endured until 1868 (Edo Period) through the reigns of 15 *Shōgun* decended from the Tokugawa family.

Ieyasu initially protected Iberian traders and missionaries, but later tried to break foreign dominance of trade in favor of Japanese traders through the Vermilion Seal Ship Trade (*Shuinsen Bōeki*). This effort lasted until 1635, and undermined the Portuguese role as intermediaries in the trade of Chinese silk, Japanese swords, and Southeast Asian products. During this period, the Japanese Towns (*Nihonjin-Machi*) flourished in the old capitals and ports of modern Vietnam, Cambodia, Thailand, The Philippines, Malaysia, and Indonesia. Japanese Catholics, expelled from

their homeland after 1585, found peaceful residence in these outlying trading centers. Japanese settled by the hundreds and thousands, and some of their leaders became recognized and retained by local authorities. One example was Nagamasa Yamada (?-1630), who became a minister of the Ayutthaya Dynasty in Thailand.

Meanwhile, *Shōgun* Ieyasu became concerned about the rapid penetration of Catholicism into Japan, even among his own men. As Reformation-influenced, anti-Reformation missionaries began emphasizing the equality of all human beings 'before God,' the loyalty of Catholic subordinates to non-Catholic authority became unreliable. Japanese followers of some missionaries began destroying Buddhist temples and Shintoist shrines. Additionally, 37,000 Japanese Catholic farmers revolted against heavy-taxing non-Catholic lords of Shimabara (now a part of Nagasaki Prefecture) and Amakusa (now in Kumamoto Prefecture) in 1637-38. The Shogunate was also offended by the selling of Catholicized Japanese to Europe as slaves by Iberian traders. In consequence, the *Shōgun* banned Portuguese entry into Japan in 1639. The Spanish had been previously excluded in 1624 due to their aggressiveness. The policy of 'National Seclusion' (*Sakoku*) was completed.

With the institution of National Seclusion, more than 10,000 Japanese then living throughout Southeast Asia were forbidden to come home under threat of the death penalty, because of their possible exposure to Catholicism. Similarly, no Japanese were allowed to sail out of Japan. When Japanese emigrant pioneers became abandoned by their home government, their overseas settlements perished rapidly. The Shogunate then dominated all Japanese foreign trade and accepted only limited numbers of Chinese, Korean, and Protestant European traders. Protestants were accepted as trade partners because of their secondary interest in Chiristian missionary activity. As British traders had been outcompeted by the Dutch and retreated from Japan in 1623, Holland became the sole European nation maintaining a relationship with Japan through the National Seclusion period. Once a year, the Dutch Factory Captain at Nagasaki traveled to Edo to report News from the West (*Oranda Fūsetsugaki*) to the *Shōgun*. Most Japanese, however, remained ignorant of the world outside Japan. This continued until 1854, when a newcomer from the east terminated Japan's isolation that had lasted for more than two centuries.

The Return of Westerners and the Modernization of Japan

By the late 18th century ships from Russia, Britain and United States were frequently appearing along the coast of Japan. Some foreigners requested that Japan's sea ports be opened, which the Shogunate firmly refused. When the Dutch Factory at Nagasaki reported that China had ceded Hong Kong to the British as a consequence of the First Opium War (1840-42), the Shogunate softened its position, and began to render supplies to incoming and disabled foreign ships. In 1844, King Willem II of Holland (reigned from 1840-49) sent a letter to the *Shōgun* recommending withdrawal of the national seclusion policy, explaining that the world situation was changing. In 1852, the Shogunate received the second letter of similar purport from Holland.

In 1853, US President, Millard Fillmore (1800-74; term 1850-53), dispatched 4 warships of the East India Fleet to force the Shogunate to open some Japanese sea ports. The US had previously sent a first and unsuccessful official mission to Japan in 1846, due to the breakout of the Mexican-American War (1846-48). However, once gold had been discovered in the Territory of California in 1848, development of the US West and Pacific coast progressed rapidly. Americans began seeking new Pacific trading routes to China, which necessitated resupply of US steam ships of

that era by ports in Japan. The American whaling fleet had also become active in the North Pacific, and needed food, fuel and water supplies from Japan.

Commodore Matthew Calbraith Perry (1794-1858) of the US East India Fleet intimidated the Shogunate with his armed steamers (called Black Ships or *Kuro-Fune* by the Japanese), and successfully handed President Fillmore's letter to Japanese officials. They promised to provide an answer within a year, upon which the US fleet left. In January 1854, Perry came back to Edo Bay with 7 warships, and Shogunate reluctantly concluded the 'Treaty of Peace and Amity between the United States of America and the Empire of Japan' (*Nichibei Washin Jōyaku*), ending Japan's 215 years of national seclusion (*Kaikoku*). That year, similar treaties with Britain and Russia were concluded, of which the latter determined the northern border of Japan. In 1855, Japan concluded another similar treaty with Holland.

As a result of the Treaty of Peace and Amity, the US sent Townsend Harris (1804-78) as its first Consul General in Japan (term 1856-59; Minister Resident 1859-62). Arriving in Japan, Harris intimidated the Shogunate, citing the events of the Second Opium War (1856-60) in China. In 1858, the 'US-Japan Treaty of Amity and Commerce' (*Nichibei Shūkō Tsūshō Jōyaku*) was concluded. Similar treaties were

concluded with Britain, Russia, Holland, and France that same year. In addition to most-favored-nation clauses, these treaties all extended extra-territorial privileges to Westerners, and moderate fixed scales of import/export duties without Japanese tax autonomy. Privileges to Westerners lasted until 1899, while the proscription of Japanese tax authority continued until 1911. These Unequal Treaties (*Fubyōdō Jōyaku*) plagued both the Shogunate during its last decade and subsequent Japanese modernization under the new Meiji government.

With the sudden opening of Japanese ports to international trade, the Japanese economy fell into disruption. Silk and tea found eager customers overseas, and were exported without controls, which caused their domestic prices to soar. This in turn triggered a price hike of unexported commodity goods like rice and soybeans. The exchange of gold to silver in Japan was 1 to 5, while being 1 to 15 on international markets. The Shogunate desperately tried to curb the outflow of gold by minting lower carat coins, which fueled inflation. Increased military expenditure for coastal defense was reflected in heavier taxation. Never in its history had the Shogunate experienced popular unrest and uprisings to the level of this period. The lives of lower class *samurai*, poor farmers

and city dwellers became most miserable. They thought Westerners were the evil causing their hardship. Young lower class *samurai* under various domain (*han*) lords became politically active, urging drastic reforms for their domains and the Shogunate. A nationwide front against the Westerners (*Jōi-ron*) was formed. The Emperor, who had been rendered a recluse by centuries of *samurai* political domination, was re-identified as the real authority (*Sonnō-ron*), symbolizing the 'sacred' tradition of Japan.

As the new *samurai* leaders gained experience from traveling overseas, and faced Western military sanctions against some of their domains (1863-64), their common goal shifted in another direction. They called for the overthrow (*Tōbaku*) of the outdated feudal Shogunate and the establishment of a centralized modern nation state, to insure Japan's survival through an age of severe international imperialism. After a series of battles and negotiations between the Shogunate and allied domains under the flag of Emperor Meiji (1852-1912; throne 1867-1912), a new Japanese government was founded in 1868 (*Meiji Ishin*).

The Meiji government's urgent goal was to build 'a rich country with a strong military' (*Fukoku Kyōhei*) to secure the independence of Japan, following Western models. To achieve this goal, 'Increase Production and Promote

Industry' (*Shokusan Kōgyō*) became the national slogan. At the end of the Edo Period the Japanese population was about 30 million, of which 7 percent were *samurai* caste, 84 percent were farmers, 7 percent were townsmen (artisans and merchants) and 2 percent were other castes. To quickly modernize the government and industrialize the country, initial capital was sought from the large agrarian sector. Another option, imposing protective tarrifs on international trading, was impossible because of the Unequal Treaties. The new government therefore needed to create a unified system of taxation on farming lands to stabilize its revenue. This tax was easy to collect, difficult to evade, and above all, it would not fluctuate with harvests (Norman edited by Dower 1975). Certificates of Land Ownership (*Chiken*) were therefore issued in 1872 to initiate agrarian tax reform.

This tax reform initiative repealed the Shogunate Ordinance of 1643 (*Denpata Eidai Baibai Kinshi Rei*), which had forbidden both the sale and purchase of farming lands. Apart from selling and buying lands, the division of farmland among children had also been restricted (*Bunchi Seigen Rei*). So-called 'non-inheritors' (normally brothers other than the eldest son) of small farmers had no rights to land possession, except through marriage to a female

successor in a matrilineal family or by joining new ricefield (*shinden*) development projects in marginal lands.

Members of the independent farming caste had formerly paid an annual tribute (*nengu*) of rice based on their harvests. This tribute was the economic base of the Shogunate regime. An average family farm was about 1 hectare in size, and the Shogunate was determined to protect these family farm units from subdivision. The Shogunate also tried to control commercial cropping (*Tahata Kattesaku-no-Kin*), out of fear that it might replace rice fields, exposing farmers to the vagaries of the currency economy. Dissolution of the farming class had nevertheless been occurring since the late 17th century. This was caused by both the pervasive currency economy and natural disasters in rural Japan. Many small farmers, including the so-called 'non-inheritors,' had been forced to become tenant farmers called *Mizunomi-Byakushō* (literally 'water drinking farmers'). Heavy *samurai* taxation and land rents left them without much food for themselves. Destitute farmers eventually migrated to large cities like Edo and Ōsaka to find marginal jobs. Such urban migration had been prohibited by the Shogunate, as it left farm land deserted without cultivators (*te-amari-chi*). Orders were issued to

return urban drifters to their rural homes (*Hitogaeshi Rei*), but this met with little success.

Meanwhile, productivity of land and labor continued to increase due to technical improvements, and this spurred commercial cropping - the diversification of crops and cultivars. Soon the ratio of Shogunate tax revenues to agricultural production as a whole became significantly reduced. The succeeding Meiji government therefore moved toward a modern system of taxation, based on land ownership rather than caste poll or crop harvest. In response, landlords organized themselves to form an influential political block in the national congress.

In 1873, the Land Tax Reform Law (*Chiso Kaisei Jōrei*) was enacted. By the end of 1881, agrarian land values had been assessed throughout Japan. The assessed value of each family farm was derived from past annual tribute paid to the Shogunate, averaged over several years. This average annual tribute was considered to be 3 percent of a farm's current assessed value. The Meiji government thereby imposed a 3 percent annual cash land tax on each family farm, along with a 1 percent local surtax. This was a disadvantageous system for small to medium scale farmers, since markets for agricultural produce were still underdeveloped in rural Japan. And even in a bad harvest year, farmers had to pay

the same cash tax to the government, still unable to get their products to lucrative markets for sale. Many farmers resorted to selling their land ownership certificates, dropping to tenant farmer status. As tennant farmers they could still pay tribute in kind, based on each year's harvest.

Additionally, lands that had formerly been collectively owned (*iriaichi*) were assumed to be ownerless, and confiscated by the government. This deprived the poorest farmers access to natural resources such as fodder, fuel and compost materials.

Peasant riots against this new tax system peaked in 1876. In 1877, the government responded by reducing the land tax to 2.5 percent of a farm's assessed value. The annual local surtax was also reduced to 0.5 percent. This was not enough to assist destitute farming families.

With the capital derived from land taxation, Public Model Factories (*Kan'ei Kōjō*) were established, employing Western technical advisors on special salaries. Abundant and inexpensive labor for these factories was supplied primarily from poor farming families, and the descendants of fallen *samurai*. Filature, which grew during the period of national seclusion as rural factories, was thus industrialized. One of these industries, silk production,

increased to 45,000 metric tons in 1934. Silk was a major export to Europe and the United States, and its sale helped finance the modernization of Japan.

The old domains were replaced by a new prefectural system (*Haihan Chiken*) in 1871, while the modern Conscription Ordinance (*Chōhei Rei*) was enacted in 1873. These changes rendered the feudal *samurai* both unnecessary and an encumbrance to the new government. Taking the place of their former lords, the Meiji government initially pledged to support the *samurai* with heredity stipends. These payments soon accounted for 30 to 50 percent of the government's annual expenditure, a sum that could have been more profitably directed towards the urgent needs of the country. In 1876, the government decreed that all stipends for the next 10 years would be converted to public bonds at 5-10 percent annual interest, with the principal unredeemable for 5 years (*Chitsuroku Shobun*). Many of the poorer former *samurai* wound up selling their bonds at a loss. Finally, in 1876, the *samurai* were made to forfeit their swords (*Haitō Rei*), the symbolic core of *samurai* pride. The animosity of weakened *samurai* towards the Meiji government was expressed in a series of rebellions from 1874 to 1877. Facing both *samurai* rebellions and peasant riots against land tax reform, the Meiji government maintained but

tenuous control of the country. During this precarious period, Japan would face external exposure to opportunistic Western nations.

While Western invasion of Japan was anticipated at this period, the gravest concern was that the northern border would be overrun by Russia. In 1869, the Hokkaidō Colonization Office (*Kaitakushi*) was founded in Sapporo (transformed to Hokkaidō Prefectural Office in 1882). During the succeeding 15 years, 105,593 Japanese colonists were sent to Hokkaidō from the mainland (Ichihashi 1932). From 1873 to 1904 (the year Russo-Japanese War began), Colonist Militias (*Tondenhei*) were organized against possible Russian aggression in the Far East. The mainlanders who settled in Hokkaidō were recruited from both farming and former *samurai* families. This emigration reduced socio-political tension among those who had become impoverished and discontented by the new regime. Agricultural development in the northern frontier was modeled after the US model because of similar demographic conditions. It was assisted by American advisors like William Smith Clark (1826-86), who founded Sapporo Agricultural College (*Sapporo Nōgakkō*) in 1876, the first agricultural institute of higher education in Japan, which is now called Hokkaidō University (*Hokkaidō Daigaku*).

Homestead settlements (*kaitakuchi*) and other developmental enterprises were carried out, causing much hardship to Hokkaidō's indigenous Ainu tribes in the process.

The US again turned its attention to the Pacific region after the Civil War (1861-65). Brokers began recruiting Japanese immigrants as contract plantation workers. In 1868, the first group of 42 Japanese set off to work for rice fields in Guam, while 148 others emigrated to the sugarcane plantations of Hawaii. They left home without permission from the Japanese government during the initial domestic confusion of the Meiji Restoration. In 1869, 40 Japanese immigrants were led by a Dutchman to El Dorado, California, where they established the 'Wakamatsu Settlement.' These immigrants apparently intended to start sericulture in the US.

At this period, however, the Meiji government was occupied with the modernization of Japan, and paid little attention to the merits of emigration. The government was even reluctant to send migrant workers overseas, due to troubles created afterwards by the smuggled 'Emigrants of 1868' (*Gannen-mono*) in foreign territories. Though requests for workers came repeatedly from Hawaii, and other countries such as the Netherlands (1871), Peru (1877) and Spain (1880), the government declined all requests. Instead,

Japanese emigrants were directed to the domestic frontier of Hokkaidō. Many Japanese were apparently "ready to go anywhere in the world for jobs" (Brazil Nihon Imin Hajūnen-shi Hensan Iinkai 1991). As previously noted, there was little chance of upward social mobility for both small tenant and 'non-inheritor' farmers in rural Japan. Their mass migration to urban areas had been ongoing since the Edo Period. Modernization under the new regime opened new opportunities to them as unskilled laborers in urban industry and commerce, or as soldiers in the newly established military. However, as most were farmers, farm work, even overseas, could have been an attractive option if reasonable payments were guaranteed.

The Meiji government, facing rebellion and riots nationwide, printed excessive paper money to pay for military operations. This caused inflation in 1877. Subsequently, in 1880, local taxes and indirect taxes were raised, and the government adopted deflationary policies in 1882. Markets for agricultural products were severely depressed, which further hurt farmers. Hundreds of thousands of farms were confiscated for non-payment of land taxes between 1883 and 1885. Peasant riots peaked again. The government now seriously began to consider the emigration option. By directing disaffected social groups overseas, for example, US$ 12 million of annual transfers

could be anticipated from 100,000 migrant workers (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991). Left at home, these workers might otherwise contribute to social disorder and domestic impoverishment. In 1883, 37 pearl oyster pickers were authorized to go to Australia as an experiment. In 1884, emigration to Hawaii was finally approved.

Immigration to Hawaii and the United States

The Hawaiian Islands were 'discovered' in 1778 by the British Captain James Cook (1728-79), and were known as the Sandwich Islands. Hawaii soon received immigrants from various nations of the Western world. The US first manifested a special interest in these islands in 1842. After gold was discovered in California in 1848, its rapidly growing population was partly supplied by Hawaiian products like potatoes, rice, wheat, and corn. Sugarcane plantations soon dominated the Hawaiian economy, but depended upon a foreign labor force. As early as 1853, there were 364 Chinese plantation workers in Hawaii. They were followed by workers from Portugal and other European countries. In 1875, the US and Hawaii signed a reciprocity treaty, stipulating that Hawaiian sugar would be admitted to US free of duty in exchange for the establishment of a naval base at

Pearl Harbor. This boosted Hawaiian sugar production, which required even more migrant workers.

The US Restriction Act of 1882 excluded Chinese immigrants from the US mainland for ten years. This influenced the American dominated Hawaiian government to eventually ban Chinese immigration to the islands in 1887. Sugarcane planters tried to enlist the sevices of more Portuguese and other European immigrants, but this turned out to be costly and unsatisfactory. Planters then began to consider Japan as a source of labor. In 1884, the Hawaiian Board of Immigration and the Japanese government agreed on the conditions that follow (these were revised and ultimately signed by the Hawaiian and Japanese governments as the Convention of 1886).

1) The Hawaiian Board of Immigration shall provide free passage to and from Japan for Japanese laborers, their wives, and children.

2) The Board shall guarantee the Japanese employment without signing an advance labor contract

3) The minimum rate of wages shall be nine dollars per month with food or fifteen dollars without food.

4) The term of contract shall be three years.

In 1885, based on this agreement, the first 'Public-Contract Immigrants' (*Kan'yaku Imin*) were sent to Hawaii. Records show that 28,000 people applied for the projected quota of 600 that year, and that 1,930 were eventually

allowed to board two ships. The emigrants were officially supervised, but their handling was actually carried out by private agents subsidized by the Hawaiian sugarcane industry. Such agents tended to exploit emigrants, which caused public criticism in Japan. The Japanese government suspended emigration under this scheme in 1894, but by then some 30,000 contract workers and their family members had been shipped (3,000/year). Immigration to Hawaii continued thereafter in a modified form, under the new Emigration Protection Law of 1894 (promulgated in 1896). This provided for the recruitment of 'private contract workers' through agencies authorized by the Minister of Home Affairs. By 1899, about 50,000 such contract workers had gone to Hawaii (10,000/year). Following the US annexation of Hawaii in 1899, however, the new Territorial Government established in 1900 terminated all conventions operating in Hawaii. Japanese emigration was for a time freed from former official arrangements, until the Gentlemen's Agreement between the US and Japan took effect in 1908. By then 76,000 more Japanese had migrated to Hawaii (8,400/year). From that time, until the New Immigration Law of 1924 excluded Japanese immigration to the US, some 40,000 Japanese migrant workers arrived in Hawaii (2,500/year). During the 40 years after 1885, a total of 199,564 Japanese reached Hawaii, of which 113,362 (57 percent) were recorded

to have subsequently returned to Japan, leaving a balance of 87,772 at the end of 1924. An estimated 37,000 others moved further eastward to the US mainland between 1902 and 1909, leaving about 50,000 (25 percent) settled in Hawaii. This indicates that the majority of Japanese immigrants to Hawaii came on a temporary basis, or were 'birds of passage' *dekasegi* migrant workers who intended to ultimately return home (see Table 2-1). [Ichihashi 1932]

Table 2-1. Asian population in Hawaii (1890-1930)

Yr.	Chinese	Japanese *Korean**1	Filipino	Hawaii Total	Related Events
1890	16,752 (18.6)	12,610 (14.0)		89,990 (100.0)	1882 Chinese exclusion in US
1900	25,767 (16.7)	61,111 (39.7)		154,001 (100.0)	1885 Hawaii-Japan contract immigration began
1910	21,674 (11.3)	79,675 (41.5)	2,361 (1.2)	191,909 (100.0)	1887 Chinese exclusion in Hawaii
		4,533 (2.4)			1898 US annexation of the Philippines
1920	23,507 (9.2)	109,274 (42.7)	21,031 (8.2)	255,912 (100.0)	1899 US annexation of Hawaii
		4,950 (1.9)			1908 US-Japan Gentlemen's Agreement
1930	27,179 (7.4)	139,631 (37.9)	63,052 (17.1)	368,336 (100.0)	1910 Japan annexation of Korea
		6,461 (1.8)			1924 Asian exclusion in US (except US territory residents)

Source: Ichihashi(1932)
*1 Koreans (*in italic*) are included in the total Japanese number after the annexation in 1910.

Japanese immigration to the US mainland was not significant until 1890, when the US Census enumerated a total of 2,039 Japanese residing in the US. From 1891 until 1899, when the US annexed Hawaii, a further 15,000 Japanese were admitted to the US (1,700/year). From 1900 to 1908,

about 67,000 more were admitted (7,400/year). In addition, more than 37,000 were reported to have left Hawaii for the continental US between 1902 and 1909 (4,600/year). Nine thousand other Japanese were supposed to have entered the US from Mexico between 1906 and 1907 (4,500/year). In 1907, the US Congress authorized then President Theodore Roosevelt (1858-1919; term 1901-09) to refuse entry to immigrants who did not possess passports originally drawn for the US. Accordingly he issued the proclamation ordering that "Japanese and Korean laborers, skilled or unskilled, who have passports to go to Mexico, Canada, or Hawaii, and come therefrom, be refused permission to enter the continental territory of the United States". This was followed by the Gentlemen's Agreement between The US and Japanese Governments (*Nichibei Shinshi Kyōyaku*) in 1907 (which took effect in 1908), in which the Japanese government agreed to issue emigration passports only to: 1) former US residents; 2) parents, wives or children of residents in the US; and 3) agriculturists already settled in the US. In return, the US government agreed to mitigate anti-Japanese sentiment in the US. As a result, the 1909 to 1910 period witnessed a significant drop in Japanese admitted to the US, to 5,000 (2,500/year) in total. In the US census of 1910, a total of 72,157 Japanese were living on the US mainland, 67,655 *issei*

and 4,502 US-born *nisei*. Compared to the figures of 20 years earlier, this indicated an increase of 70,118 people (3,500/year). Roughly 53 percent of admitted immigrants had remained on the US mainland, not including those that immigrated via Canada. This was more than double the permanent residency figures for Hawaii, but still, many Japanese maintained their intention to be *dekasegi,* or temporary migrants. This trend was reversed from 1911 to 1924, when about 127,000 Japanese were admitted (9,100/year), and 111,000 departed (7,900/year), leaving only 16,000 (13 percent) permanent residents. This could partly be due to increasing anti-Japanese sentiment in the US. In 1924, the new Immigration Act excluded Japanese immigration to the US. The census of 1920 counted 111,010 Japanese (81,338 *issei* and 29,672 US-born *nisei*) living on the mainland US, and the 1930 census listed 138,834 Japanese in total. [Ichihashi 1932]

Exclusion of Japanese immigrants followed a course similar to that experienced by the Chinese immigrants who preceded them. The influx of Chinese laborers into California began in 1850, with the arrival of 4,000 coolies and gold miners. From the start, Chinese faced the imposition of special state head taxes and other discriminatory laws against them. One year later, the

Chinese population in California had jumped to 25,000. In 1855, 1858 and 1862, California adopted acts to prevent further immigration of Chinese, and to protect white laborers from their competition. In 1863, Chinese were made eligible for dangerous and difficult employment with the Central Pacific Railroad in rail construction jobs that white workers would not tolerate. From 1864 until the railway was completion in 1869, Chinese constituted 80 to 90 percent (4,000-9,000 workers) of this project's workforce. These workers soon became unwanted, however, when such marginal labor markets disappeared and the regional economy stagnated. [Tung 1974]

White laborers resented the 'Yellow Peril' snatching their jobs away. In 1868, some 40,000 Chinese miners were driven from their claims along the West coast (Tung 1974). They then sought employment as farm laborers or as household workers. In 1870, California ordered Chinese children to attend public schools separate from whites. Seward (1881) identified as many as 62,674 Chinese residents in the US in 1870 (the census recorded 63,199), of which 84 percent were concentrated in the Pacific States and fully 78 percent in California alone. Chinese comprised about 9 percent of the total population of California in the 1870s. In 1872, Chinese were prohibited from owning real estate or securing business licenses in California. In 1879, the California

Constitution forbade: further Chinese immigration; Chinese public employment; and Chinese residence in certain cities and towns. In 1880, the California legislature enacted a law making the employment of Chinese in the private sector illegal. California agriculture was still highly dependent on Chinese agricultural labor at this time, as more than three quarters of farm workers were Chinese (Mears 1926; cited by Ichihashi 1932). The 1880 census enumerated 105,465 Chinese, with their highest concentration in California. California labor unions took strong political initiatives to completely exclude Chinese from the US mainland, culminating in The Restriction Act of 1882.

Many Japanese began arriving in California in the 1890s, as the US Chinese population began to decline after their exclusion (Mears 1928). It may be that their labor was wanted in the growing agricultural sector, to replace cheap farm labor formerly supplied by Chinese. A 1910 report of an investigation of the Japanese by the California State Comissioner of Labor concluded that:

> "Japanese or some form of labor of a similar character, capable of independent subsistence, quick mobilization, submissive of instant dismissal and entailing no responsibility upon the employer for continuous employment, is absolutely necessary in the California orchard, vineyard, and field, if these vast industries are to be perpetuated and developed. ... the positive expression of a majority of the growers of fruit and such other products as are affected by the demand, that this labor must continue to be drawn from sources beyond the United States." [Ichihashi 1932]

According to Mears (1928), the majority (65.1 percent) of the 59,000 Japanese living in Central and Northern California were still engaged in agriculture in 1924. They were farmers (39.5 percent, most of whom were tenant farmers), and farm laborers (25.6 percent). Ichihashi (1932) notes that in Hawaii more than half of all sugarcane laborers were Japanese between 1892 and 1919, 70 percent from 1899 to 1904. In 1920, still 73 percent of the 36,584 Japanese males in Hawaii had jobs on sugarcane plantations.

However, as early as 1890, a petition was submitted to Congress from 1,200 California citizens calling for enactment of a law excluding Chinese and Japanese. In 1900, an anti-Japanese movement started in San Francisco. In 1901, California Governer Henry T. Gage sent a message to the state legislature describing the need to restrict Japanese immigration, because their cheap labor would cause the same peril to American labor that had resulted from Chinese workers. Such a resolution was accordingly made by the California legislature and sent to the US Congress. Nevada adopted a similar resolution. In 1905, California sent another resolution to the US Congress to restrict Japanese immigration. In 1906, the San Francisco Board of Education segregated Chinese, Japanese, and Korean children, placing them into the Oriental School. In 1907, Federal government took measures to restrict Japanese immigration.

This resulted in the 'Gentlemen's Agreement' of 1908. During 1909, no less than 17 anti-Japanese bills were discussed in the California legislature, including a proposed alien land act, and a school segregation act. Both of these failed to be made law when the federal government intervened. [Ichihashi 1932]

The California State Labor Commissioner then resolved to investigate the Japanese labor question (resulting in the 1910 report cited above). The state legislature next sent a resolution to the US Congress favoring Japanese exclusion. The Nevada, Oregon and Montana legislatures also submitted various anti-Japanese bills and resolutions. In 1913, the California Alien Land Law was enacted. Aliens who were ineligible for US citizenship according to the Naturalization Acts of 1790, 1870 and 1906 ('those not being free white men, or of African nativity and descent') were forbidden to own land, and could only lease land for agricultural purposes for no longer than terms of three years. Lands already owned were not confiscated, but succession to heirs was not allowed, except for benefits derived from selling land. In 1913, Japanese owned 26,707 acres, or less than 0.2 percent of the total agricultural land in California (Ichihashi 1932). They leased 254,980 acres or 2.3 percent. Other states like Arizona (1912), Washington (1889 amended in 1921/23), Nebraska and Texas

(1921), and Oregon and Idaho (1923) adopted policies similar to those in California. In 1920, California enacted the New Alien Land Law, under which aliens ineligible for citizenship, and their businesses, were both prohibited from leasing land. Aliens were also forbidden to acquire stock in any organization authorized to aquire real property. This was amended in 1923 so that aliens ineligible for citizenship could no longer negotiate cropping contracts. Thereafter, Japanese were only legally allowed to work as hired laborers. The New Alien Land Law remained in effect until 1956. In the meantime, the California legislature adopted the Alien Poll Tax Law in 1921, which was judged by the court to be contrary to the treaty between the US and Japan. Ultimately, in 1924, aliens ineligible for US citizenship (all Asiatics) were excluded from legal immigration to the US. [Ichihashi 1932]

At the time of the 1930 census, the Japanese population totaled 138,834 on the mainland US, 70 percent of which was in California, and 87 percent within the three Pacific States. It is noteworthy that, while Chinese immigrants were dispersing across the US as time passed, Japanese immigrants concentrated in California (see Table 2-2). However, even at its peak in the 1920s, the Japanese portion of California's population was only 2 percent. In Hawaii,

Japanese accounted for about 40 percent of the population during the same period.

Table 2-2. Chinese and Japanese populations in the United States and California (1850-1930)

Year	Chinese in US	Japanese in US	Chin. in California (% Chin.) (% Cal.)	Jap. in California (% Jap.) (% Cal.)	California Population
1850	4,000		(100.0) 4,000 (3.5)		115,000
1860	34,933		(90.0) 31,439 (8.3)		381,000
1870	63,199		(80.0) 50,559 (9.0)		561,000
1880	105,465	148	(70.0) 73,825 (8.5)		865,000
1890	107,448	2,039	(60.0) 64,469 (5.3)		1,210,000
1900	89,863	24,326	(50.0) 44,932 (2.6)	(42.0) 10,151 (0.6)	1,692,000
1910	71,531	72,157		(57.0) 41,356 (1.7)	2,433,000
1920	61,639	111,010		(65.0) 71,952 (2.1)	3,426,000
1930		138,834		(70.0) 97,456 (1.7)	5,733,000

Sources: Seward (1881), McKenzie (1927), Mears (1928), Ichihashi (1932) and Lavender (1976); 1890 population of California was estimated as 40% increase in 1880's and 1890's (increased 44% in 1900's and 41% in 1910's).

A review of historical population data and the decisions of the California State Labor Commissioner in 1910 indicates that anti-Japanese agitation in California had complex causes, apart from economics alone. Though anti-Japanese activists claimed that economic concerns fueled their discontent, Mears (1928) cites the pointed comments of leading citizens to indicate broader worries.

> "We dealt unjustly with the Indian, and he died. We dealt unjustly with the Negro, and he submits. If Japanese ever come in sufficient numbers to constitute a race problem, we shall deal unjustly with them - and they will neither die nor submit." [Rowell 1913]

> "The Chinaman dreads competition with the white man, and avoids it; the Japanese courts it. The Chinaman is entirely content to do those kinds of labor that the white man shrinks from; the Japanese wishes to meet whiteman on his own ground, and to oust him from it.

> The Chinaman is willing to be a hewer of wood and drawer of water; the Japanese has no aptitude for menial tasks nor any intention of performing them except as stepping-stones to his own high ambitions." [Coryn 1909]

In Portsmouth, New Hampshire in 1905, President Theodore Roosevelt (1858-1919; term 1901-09) mediated an agreement to conclude the Russo-Japanese War (1904-05). Soon afterwards Russo-Japanese relations grew cordial, as both their interests in China brought them together in opposition to intervention by any third country there. This relationship became a serious obstacle to US capitalists venturing into the region.

American resentment of Japanese could have been amplified by worries that Caucasian dominance of the world might some day be overturned. Hopes for eventual independence among influential native leaders in Western colonies had, indeed, been buoyed by the outcome of the Russo-Japanese War. Furthermore, there was a fear of Japanese 'invasion' of the US. McKenzie (1927) noted that Japanese immigrants, unlike their Chinese predecessors, chose to bring their wives to establish homes in the US, thereby shifting attention from questions of economic competition, immediate or ultimate, to questions of assimilation and amalgamation. There were concerns of possible intermarriages with Japanese, which would assimilate children both biologically and culturally into

America. In objection to this was the argument that having such crossbreeds would be of little benefit to US society.

In any case, public decisions in the US caused Japanese immigrants to progressively lose hope of working their own lands. Ichihashi (1932) concludes that:

> "Japanese have interested themselves in farming from the beginning of their appearance on the Pacific Coast, at first working as farm-hands, then gradually emerging as contract, share, tenant, and independent farmers. The intention of the land laws was to check the further development of the process, and the laws everywhere having proved effective, many Japanese have left the farm and drifted to towns and cities to find other occupations. ... As Japanese children grow older they become more conscious of the difference in legal status between themselves and their parents; parents not only do not enjoy rights and privileges that children do, but they suffer economically because of the discriminatory land laws. Such a condition could not remain without affecting the social status of Japanese aliens in the eye of their own children who are American citizens. Parents are losing control over their children, and this tendency seems to become more pronounced in towns and cities..."

In 1921, Japanese farmers in California produced 91% of the berry crop (*Fragaria* spp., *Rubus* spp., etc.) of the State, 81.2% of the onions (*Allium cepa*), 65.4% of the asparagus (*Asparagus officinalis*), 58.8% of the green vegetables (*Brassica* spp., *Lactuca sativa*, etc), 53.3% of the celery (*Apium graveolens*), 41.5% of the sugar beets (*Beta vulgaris*), 40% of the cantaloupes (*Cucumis melo*), 39% of the tomatoes (*Lycopersicum esculentum*), etc. These farmers were organized under the Japanese Agricultural

Association, founded in 1915. This association extended technical assistance to its members through cooperation with the Agricultural Experiment Stations of California. In 1923, the association abandoned many of its activities due to the decline of Japanese agriculture resulting from the revised Alien Land Law. It then became a division of the Japanese Association of America, and finally suspended its operations in 1926. [Mears 1928]

Despite of these adversities, Japanese agriculture in California continued until the Pacific War broke out. The *nisei* Japanese-Americans excercised legal rights equal to other Americans, concerning their businesses and land holdings. Japanese producers were organized under local cooperatives, and there were regional cooperative unions. In 1940, half of 40,000 Japanese workers (*issei* and descendants) in California were still in the agricultural sector. In 1941, more than 40% of the area used for horticulture in California was cultivated by Japanese. In 1942, all of them, either *issei* Japanese or Japanese-Americans, were sent to interior relocation camps where they stayed until 1945-46. [Yagasaki 1993]

Immigration to Brazil

Background

Japanese also had interest in immigration to two other countries, Australia and Canada. The former had developed a 'White Australia' Policy during the last decade of 19th century, in response to Australian fears of mass Chinese immigration. Japanese, being also 'colored people,' were also denied entry into Australia by the Commonwealth Immigration Act of 1901. Having experienced active anti-Japanese unrest since 1895, and influenced by the US policies, Canada concluded a 'Gentlemen's Agreement' with Japan in 1907. Annual Japanese immigration to Canada was set to 150 persons per year since 1928.

Facing such linkages in anti-Japanese sentiment between countries, the Japanese government had to look for other places to send emigrants. One emigration initiative came from Viscount Takeaki Enomoto (1836-1908), who held important posts in the Meiji government before founding the Tokyo University of Agriculture (*Tōkyō Nōgyō Daigaku*). This university would later produce many Japanese farming leaders in Brazil. Enomoto had been a student in Holland (1862-66), sent there by the Shogunate to learn law, military science, and mechanics. He returned to Japan in 1867 aboard a new

Shogunate warship built in Holland. The ship made an 11 day stopover in Rio de Janeiro. When Enomoto became the Minister of Foreign Affairs of the Meiji government, he created a new division of emigration in the Minister's Secretariat in 1891. In 1893, he founded the Colonization Society (*Shokumin Kyōkai*) with the intention of establishing Japanese agricultural settlements in Latin America, particularly in Mexico at the outset. In 1894, Congressman Tadashi Nemoto (1851-1933), a member of the Society, was sent by the government to Central and South American countries to identify suitable locations for Japanese settlements. He wrote letters to Enomoto and other Society members recommending Brazil as a promising site.

Brazil had been a colony of Portugal since 1500. However, the colony had been closed not only to foreigners, but even to Portuguese by various regulations of the Portuguese monarchy. In 1808, Napoleon Bonaparte (1769-1821; crowned Napoleon I 1804-15) conquered the Iberian Peninsula, forcing the Bragança dynasty of Portugal to move to Brazil. The dynasty chose Rio de Janeiro as its new capital. At that time Brazil had a population of only 3,600,000 (including 1,910,000 slaves). The new regime opened Brazil to foreigners for agricultural and industrial development. As early as 1812, Brazil invited German

immigrants to Bahia and Espirito Santo. In 1818, Swiss and German immigrants were recruited to develop official settlements in Rio de Janeiro and Bahia. Some 400 Chinese also entered Brazil in 1819 in a pilot project of the unfinished national tea production plan, a scheme which called for the introduction of 2,000,000 coolies. This might have been intended as an alternative workforce to African slaves, which had been forbidden in European countries since the beginning of the 19th century (Brazil Nihon Imin Hachijūnenshi Hensan Iinkai 1991).

The Bragança dynasty returned to Portugal in 1821. Brazil became an 'independent' Empire in 1822, ruled by the crown prince of Portugal as its emperor. The Imperial Constitution was promulgated in 1824, which opened Brazil to non-Catholic immigrants. Most of these were Germans, recruited into colonist militias posted along Brazil's southern border. Under an 1836 law, private companies or individuals, either Brazilian or foreign, were allowed to undertake immigration and colonization projects. The emperor would grant land for these schemes. In 1839, the Imperial Constitution was amended, allowing local governments to handle immigration administration. In spite of all these state efforts, only 17,000 foreign immigrants came to Brazil in the first half of the 19th century. This was because more than 1,710,000 African slaves were imported

into the country during the same period. Slave trade was centered in Brazil because only Brazil and Cuba had remained open to slave markets in the new world since 1808. In 1850, however, Brazil suspended slave import. Descendants of slaves who had been born in Brazil were granted freedom after 1871. Slavery was finally abolished in 1888.

Anticipating a tighter supply of domestic labor after the abolition of slavery, some coffee plantation owners began experimental use of foreign contract workers as early as 1841. Foreign workers hated working where slavery was practiced, due to the servile treatment they also received. In 1859, Prussia forbade emigration to Brazil based on a passage subsidy from the Brazilian government (by 1896, Prussia released only those emigrants who intended to be independent farmers in Brazil's three southern states). France made the same prohibition between 1875 and 1908. Italy followed suit in 1889-90. However, emigration without subsidy could not be controlled, and the news of slave emancipation in Brazil prompted more European immigration there.

During the last decade of the 19th century, a total of 1,180,000 European immigrants entered Brazil. The new Brazilian Republic government, established by the 1889 revolution, set restrictions on Asian and African immigration in 1890. The concept of 'Internal Migration'

was also first stipulated by law at this time, to promote relocation of poor Brazilians from the northeast to other regions. However, these internal migrants were found to be highly mobile, not as desirable for contract workers (***colonos***) as plantation owners had hoped. In 1892, the government therefore revised immigration laws to allow Chinese and Japanese workers into Brazil. In 1894, the Prado & Jordão Company (***Companhia Prado & Jordão***) of São Paulo investigated the possibility of Japanese immigration through the Kichisa Emigration Ltd. (*Kichisa Imin Gōshi Gaisha*). This was not permitted by the Japanese government unless diplomatic relations were established with Brazil. In 1895, the Treaty of Aminity, Commerce, and Navigation was concluded between Brazil and Japan in Paris. In 1897, based on a new contract between the Prado & Jordão Company and Tōyō Emigration Ltd. (*Tōyō Imin Gaisha*), which succeeded the Kichisa Emigration Ltd., 1,500 Japanese emmigrants had been selected in Kōbe for the first shipment of laborers. The shipment was suddenly revoked, however, due to a slump of the international coffee market. Japanese emigration companies found an alternate, Peruvian outlet for their emigrant laborers in 1899. By 1923, some 18,000 Japanese had been sent to Peru. Many of these pioneers experienced harsh servitude, and fled east to the Amazon over the Andes.

Pre-World War II Immigration

In 1900, the São Paulo state government decided to subsidize Japanese as well as European immigration. This was done to address a marked drop in the arrival of European migrant workers, caused by the slump of the coffee market. In 1902, the Italian government again forbade subsidized emigration to Brazil. The Japanese government restricted workers to emigrate while expecting the Russo-Japanese War (1904-05). The São Paulo legislature considered recruiting Chinese immigrants in lieu of Japanese, but this was rejected in 1902. However, after the war, Japan entered an economic depression and strikes broke out all over the country. There was a need for emigration, but it was at this time that anti-Japanese resentment was intensifying in North America. The Japanese Minister in Petrópolis, Rio de Janeiro, Fukashi Sugimura (1848-1906; term 1905-06), visited places requesting Japanese workers, and strongly encouraged the Japanese government to take action. Laborers were needed on recovering coffee plantations in São Paulo, rice plantations in Rio de Janeiro, mines in Minas Gerais, and rubber tapping companies in the Amazon.

Inspired by the writings of Sugimura, Ryō Mizuno (1859-1951), president of Kōkoku Colonization Ltd. (*Kōkoku Shokumin Gōshi Gaisha*) went to Brazil. He accompanied

Teijirō Suzuki (1879-1970) as an experimental farm laborer on a coffee plantation. On his second trip in 1907, Mizuno signed a contract with Carlos Botelho, the São Paulo State Agriculture Secretary, agreeing to send 3,000 Japanese immigrants there over 3 years. He also agreed to market Paulista Coffee in Japan. Prior to this agreement, Botelho dispatched one of his staff to North America, to study the behavior of Japanese immigrants. On June 18, 1908, the ship *Kasato-maru* arrived in Santos, São Paulo State with 793 Japanese immigrants aboard. Seven hundred eighty-one of these immigrants were family members of coffee plantation contract workers.

Until the 1920s, most Japanese immigrants were contracted by coffee plantations. They came to Brazil with the common dream of returning home after several years, rich and with honor, or '*Kin'i Kikyō*' (literally, to return home in brocade clothes). Emigration brokers advertised that coffee plantation workers could earn up to 35 yen/month. Daily farm wages in Japan at that time was 0.2 yen/day (about 5 yen/month) including meals, while a policeman's salary was 10 yen/month (Daigo 1981). These contracts specified family-unit immigration, with each family providing more than three laborers over 11 years old.

Many eager applicants created qualified families by paper marriages and adoption (*Kōsei Kazoku*).

The Brazilian reality for immigrants was far different from the propaganda of brokers, who promised that "beans of wealth are hanging from the coffee trees waiting for you to pick up!" After one or two years, contract workers realized that Brazil was no paradise, and they had to first become independent coffee tree owners to make money as they wished. By 1911, four Japanese families moved into the First Monção Federal Settlement (***Núcleo Colonial Federal Primeira Monção***), established in 1909. The settlement was located near the Cerqueira César station, on the Sorocabana line from São Paulo. These families saved sufficient initial capital to purchase their own plots by doing extra-hour tenant farming, share cropping, or doing crop contract work on underutilized space within coffee plantations. In the 1910s and 1920s, Japanese immigrants purchased small farms (***sítios***) of 25 to 50 hectares (ha) lotted along the São Paulo railroad lines, stretching out to the interior. Most Japanese planted coffee, and initially intercropped upland rice, corn, beans, cotton, etc. Some established Japanese landowners made 4 to 6 year farm development contracts with newer immigrants, to clear more forest and cultivate coffee trees until they reached productive age. Even Japanese

immigrant farm owners did not intend to stay permanently in Brazil. They wanted to make money quickly from coffee culture, and then return home. Owning land was simply a necessary part of producing coffee profitably.

When the coffee market declined and cotton enjoyed a boom during 1930s and 1940s, Japanese farmers moved on to new sites where soil fertility had not declined. They rented lands from local landowners, and practiced slash and burn agriculture without fertilizer application. Systematic fertilization practices began only after some Japanese initiated horticulture near large cities like São Paulo. They restored exhausted and abandoned soils in old plantations by adding wastes from slaughterhouses, bedding from stables, etc. This was a derived form of manure-based organic farming practices brought from Japan. Japanese farmers produced a variety of vegetables for city dwellers. The São Paulo State Secretary of Agriculture estimated 70 percent of all marketed produce in the state in 1935 was from Japanese farms, that further augmented production later on (Comissão de Elaboração da História dos Oitenta Anos da Imigração Japonesa no Brasil 1992). Thanks to rapid population growth in São Paulo City between 1920 (579,033) and 1940 (1,326,261), Japanese achieved an exclusive market advantage by using their traditional skills of intensive horticulture.

As more Japanese farmers became economically independent during the 1910s and 1920s, they formed settlements (*Nihonjin Shūdanchi*). A permanent settlement was called ***núcleo colonial japonês*** or ***colônia japonesa*** (*shokuminchi* and *ijūchi*). There were also temporary settlements of tenant farmer groups. Overall, there were five types of settlements, distinguished by origin. They were:

1) spontaneous concentrations of farm owners in a region - e.g., Juqueri (later Mairiporã), Suzano, Mogi das Cruzes, and Cotia in São Paulo, and Okinawan settlements in both São Paulo and Mato Grosso do Sul;

2) interior lots sold by Japanese brokers in Brazil - e.g., Hirano, Tokyo, Brejão, and Vai-Bem in São Paulo;

3) lots sold by Japanese companies as part of agricultural development projects (called *ijūchi*) - e.g., Iguape (Registro, Katsura, and Sete Barras), Aliança (Primeira, Segunda, Terceira, Vila Nova, and Nova Aliança), Bastos, and Tietê in São Paulo, and Três Barras in Paraná;

4) lots sold or granted at locations within Brazilian Federal or State colonization projects - e.g., Monção (Primeira and Segunda) in São Paulo, and post-World War II interior settlements in Bahia, Mato Grosso and Amazon; and

5) temporary concentrations of tenant farmers in a region - e.g., rice settlements in Triângulo Mineiro of Minas Gerais, and cotton settlements in São Paulo.

[Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991]

Each settlement organized a Japanese association (*nihonjinkai* or ***associação japonesa***). Its function was similar to that of autonomous rural community groups (*mura*) in Japan, but with some modifications to meet the particular needs of immigrant farmers. In the annual general assembly an association chairman (*kaichō* or ***presidente de associação***) was elected. This office was comparable to a village head (*sonchō*) back home. If a settlement was extensive, divisions (*ku* or ***ramais***) were created by geographical location, and each was represented by a division head (*kuchō* or ***chefe de ramal***). A typical association had posts for secretary, treasurer, education, agriculture, hygiene, and public works. The young people in a settlement were organized into a youth association (*seinenkai*), affiliated to the Japanese association, and through which they contributed to community projects.

These Japanese associations maintained infrastructure and public facilities like roads, bridges, schools, community centers and cemeteries. Rites of passage ceremonies (*kankonsōsai*) for the living and dead members of a settlement, including the coming-of-age ceremony (*seijin-shiki*), marriage (*kekkon-shiki* or ***casamento***), funeral (*sōshiki* or ***funeral***), and anniversaries of death (*kaiki*) were carried out by the association. Other festivities like

new-year celebrations (*shinnen-kai*), colonization memorial day (*kaitaku-sai*), respect-for-the-aged day (*keirō-kai*), and year-end parties (*bōnen-kai*) were celebrated by the settlement as a whole. A community center was dedicated for these occasions, as well for other public and private assemblies, Japanese movie shows, theater and performances, haiku meetings, etc.

Education was one of the most important roles of the association. Immigrants never wanted their siblings (and so parents) to be ashamed by being ignorant when they returned to Japan. Japanese associations searched for eligible and willing Brazilians to come and teach Japanese children in their remote settlements. Japanese language teachers were appointed from among the immigrants themselves. By the early 1930s, more than 200 elementary schools (with about 10,000 pupils) had been established by Japanese immigrants in São Paulo State. An alliance of parents' associations was organized in 1927, through a suggestion by the Japanese Consulate General in São Paulo. This alliance subsidized school construction and stipends for teachers.

Agricultural facilities were also given the highest priority by Japanese associations. However, by the end of the 1910s, economic transactions became more sophisicated and involved. Immigrants realized the need to create

independent agricultural institutions distinct from other community administration. Multi-purpose agricultural cooperatives (*sōgō nōkyō*) were organized, based on Japanese cooperative models derived from the Production Union Law (*Sangyō Kumiai Hō*) of 1900. These cooperatives were unique in Brazil in terms of their integrated agricultural credit, marketing, and purchasing activities. Institutionalized agricultural credit did not exist in rural São Paulo State in the 1920s. Interest charges for personal financing and advance for unharvested crop (***aviamento***) were 2 to 5 times higher than official bank finance rates in Brazilian cities. Japanese tried to help each other through traditional informal mutual financing associations (*Tanomoshi Kō*), but their funds were limited. Marketing of products in remote areas without the use of warehouses and a means of transportation put small farmers at a great disadvantage vis-a-vis middlemen. Purchase of commodity goods and agricultural materials also depended heavily on middlemen. In 1907, Brazil introduced a corporation law that defined cooperatives. However, the first specific law which assigned special legal status to cooperatives, such as tax exempt status, did not appear until 1932.

Meanwhile, Japanese immigrants received guidance from the Japanese Consulate General in São Paulo about the

management of agricultural cooperatives to protect small farmers' interests. The Consulate General extended subsidies for coop facilities like warehouses, rice mills, and coffee selection factories. The Cotia Potato Producer Cooperative Co., Ltd. (***Sociedade Cooperativa de Responsabilidade Limitada dos Produtores de Batata em Cotia*** = *Yūgen Sekinin Kabushiki Gaisha Cotia Jagaimo Seisansha Nōgyō Kumiai*) was organized by 83 farmers in 1927 under the Brazilian corporation law. This would later become the largest multi-purpose agricultural cooperative in South America (***Cooperativa Agrícola de Cotia-Cooperativa Central***), having 16,000 members by the late 1980s. Other agricultural coops were established in 1928 in Registro, Katsura, and Sete Barras. Forty-nine potato farmers established the Juqueri Coop in 1929, which would become the 10,000 member ***Cooperativa Central Agrícola Sul-Brasil*** by the late 1980s. In 1933, São Paulo State created the Cooperative Assistance Department (***DAC*** [***Departamento de Assistência ao Cooperativismo***]) under the Secretary of Agriculture. One of its functions was to encourage Japanese farmers to organize cooperatives. In 1934, the Central Union of Japanese-Brazilian Production Unions (***Cooperativa Central Agrícola Nipo-Brasileira*** = *Nippaku Sangyo Kumiai Chūōkai*) was created at the suggestion of the Japanese Consul General in São

Paulo. By 1934, 53 Japanese agricultural coops were operating, 18 of which were registered under the Brazilian Cooperative Law of 1932, and 16 of which joined the Central Union. In 1942, this union's name was changed to Central Agricultural Cooperative of São Paulo (***Cooperativa Agrícola Central de São Paulo*** = *São Paulo Sangyō Kumiai*).

During World War I (1914-18), and for several years after, the Japanese plutocracy (*zaibatsu*) and a new capitalist class experienced the euphoria of economic prosperity. However, low-income Japanese (more than 90 percent of the nation) were suffering from a sudden rise in commodity prices. These prices peaked in 1919, having increased by almost 350 percent since 1914. Real income during this period dropped by as much as as 90 percent. To satisfy politically powerful landowners, the price of rice was left uncontrolled. Consequently, it increased by almost 300 percent in the five years after 1914. Landowners were still collecting rent in kind, while paying a fixed land tax to the government.

In August of 1918, a protest of fishermen's housewives in Toyama Prefecture against the inflated rice price developed into a riot. The riot spread nationwide. The rice warehouses of traders were attacked, and rich people were assulted. An estimated 13,000,000 people participated

in these riots over two months (*Kome Sōdō*). After 1919, however, commodity prices came down, including the price of rice and other agricultural products. Tenant farmer disputes (*Kosaku Sōgi*) became rampant in rural villages, where farmers demanded rent reductions. From 1917 to 1941, about 73,000 of such rural upheavals were recorded. During this post-war panic the Tōkyō Earthquake of 1923 (*Kantō Daishinsai*) hit the heart of the Japanese nation. When this occurred the Japanese government subsidized emigration to Brazil for those who suffered in the earthquake. In 1924, Japanese were denied entry into the US by the new US Immigration Act. The following year the Japanese Ministry of Foreign Affairs reorganized its emigration division. The ministry began to pay passage and emigration brokerage fees for emigrants heading to Brazil. These people were now called 'National Policy Emigrants' (*Kokusaku Imin*).

In 1927, the financial crisis spread nationwide. This was triggered by the bankruptcy of *Suzuki Shōten*, a new *zaibatsu* that had expanded quickly during World War I. In 1929, the Great Depression broke out. Rural Japan became crowded with millions of unemployed people. These included dismissed laborers from urban industries, who had been sacked under the government's administrative guidance for rationalization. The agricultural sector suffered from a

flat market, especially silk exported to US. By 1931 silk prices had fallen to 1/3 of their 1929 levels. In the same year, bad harvests caused by cold weather in northern Japan became tragic. Famine gripped rural children, causing rural girls to be sold in the cities. Many farmers had to sell their small ancestral fields that had been handed down for generations. In 1932, the Japanese government offered an outfitting allowance to every emigrant above 11 years of age, to attract more candidates for emigration. Without having to worry about moving expenses, many poverty-stricken families were attracted to Brazil. It was expected that Brazil would at least be a more promising place than their homeland. After all, some Japanese immigrants there had already become small farm owners, and were requesting that new immigrants come to work for them.

From 1927 to 1934, 15,000 Japanese departed for Brazil annually. However, only 5,000 departed in 1931, the year of the Manchurian Incident (*Manshū Jihen*). The peak emigration year was 1933-34, when more than 21,000 Japanese departed. Tatsuzō Ishikawa (1905-85) based his novel, *Sōbō* (Populace; awarded the first Akutagawa Prize), on his experiences as an assistant shipping director of nearly 900 Japanese emigrants heading to Brazil in 1930. He recounts how poor farmers were drifting to the other side of the world, the majority

of them having "sold all of their tiny hereditary fields and belongings at home" and "saying their last good-byes to family tombstones". This was happening simply because they "could not make their livelihood in Japan". Politicians seemed to be "making light of farmers' dire situation... only caring for the interests of entrepreneurs and capitalists" during the Great Depression.

Politicians blamed the economic crisis on 'Japan's overpopulation,' which could be solved by emigration, as Western countries had done. Little was said about the need to make major socio-economic changes to achieve more equity in the distribution of wealth. Emigrants were inspired by the words of government officials and emigration brokers, who encouraged them to become the 'pioneers of overseas development of immense and fertile soil' in Brazil. Emigrants were told to be be thankful for the 'grace of the Japanese Emperor and the Brazilian President' who gave them this opportunity, by providing them with travel expenses and other special facilities. [Ishikawa 1935]

Ishikawa notes:

> "Emigrants expressed resignation mixed with hope. Everyone had hope. Their battles for survival against poverty had made them rather desperate, and even reckless. When they arrived at the Emigration Center (in Kōbe), they were silent. Many perceived themselves to be expelled, beaten escapees, or fallen leaves gathered by a whirlwind. Were they to be hopelessly adandoned in Brazil? However, as they made friends and became more intimate day by day, they encouraged each

> other and soon forgot to consider themselves fallen leaves. They dared to dream of themselves as heroic pioneers of overseas development, just as the emmigration propaganda had hailed."

Unfortunately, they would be awakened from their reveries after the 45-day passage to Brazil.

Though the majority of immigrants considered their emigration temporary ('bird-of-passage' minded), the first permanent immigration project was launched in 1913. Ikutarō Aoyagi (1865-1943) of *Tōkyō Syndicate* was granted land from São Paulo State to establish Japanese agricultural settlements. This estate was called Iguape Settlement (***Colônia Iguape;*** 50,000ha), including the three settlements of Registro, Katsura, and Sete Barras. Registro would later become famous for its production of black tea, introduced from Sri Lanka by Torazō Okamoto (1893-1981) in 1934. The Iguape Settlement was taken over by the Brazil Development and Colonization Corporation (*Brazil Takushoku Kabushiki Gaisha* = ***Companhia de Colonização do Brasil***) in 1913. In 1919, it was absorbed by the Overseas Enterprise Promotion Corporation (*Kaigai Kōgyō Kabushiki Gaisha* or *Kaikō* = ***Companhia de Fomento Industrial no Ultramar***), the sole Japanese emigration company after 1917. The *Kaikō* worked within the policy guidelines of the Japanese government, recruiting emigrants from Japan and placing them on

Brazilian farms. The company also opened a bank, ***Casa Bancária Kaikô***, for immigrants in 1937.

Meanwhile, Japanese prefectural governments started organizing Overseas Associations (*Kaigai Kyōkai*) after 1915, for the purpose of educating prefectural residents about emigration. In 1924, Nagano Prefecture Emigration Association (*Shinano Kaigai Kyōkai* = ***Associação Ultramarina de Shinano***) established the Aliança Settlement (***Colônia Aliança;*** 5,500 ha) in São Paulo State. This project was then joined by the Prefecture Emigration Associations of Tottori (1926), Kumamoto (1928) and Toyama (1928), that purchased lands next to each other. Agro Nascente (1988) cited 31,864 ha (13,167 ***alqueires***) as the total area of the Aliança Settlement. In 1927, the Japanese government enacted the Emigration Cooperative Law (*Kaigai Ijū Kumiai Hō*), and directed each prefecture to organize an emigration cooperative. In the same year, the National Federation of Emigration Cooperatives (*Kaigai Ijū Kumiai Rengōkai*) was formed. In 1929, it incorporated Brazil Development and Colonization Cooperative Ltd. (***Sociedade Colonizadora do Brasil Ltda.*** = *Yūgen Sekinin Brazil Takushoku Kumiai* or *Burataku*) in São Paulo. This new corporation succeeded the former Prefecture Emigration Association settlements, and purchased a total of 178,000 ha of land at Bastos, Aliança

and Tietê in São Paulo and Assaí in Paraná. By 1941, about 2,500 Japanese farming families had settled in these locations.

The Brazil Development and Colonization Cooperative Ltd. also initiated 'Love the Land Campaign' (***GAT*** [***Gozar a Terra***] *Undō*) to encourage immigrants to stay permanently and commit to improving the soil. To achieve this goal, the company furnished each settlement with a rice mill, a coffee selection factory, a cotton gin factory, a sawmill, a silkworm breeding center, a cocoon drying factory, a silk-reeling factory, a food oil factory, an ice factory, a brick factory, an agricultural tool repair shop, a warehouse, a primary school, a hospital, a pharmacy, etc.

In the late 1930s, the Brazil Development and Colonization Cooperative Ltd. established affiliated corporations such as a bank ***Casa Bancária Bratac*** in 1937 (which became the ***Banco America do Sul*** = *Nanbei Ginkō* in 1940), a trading company (1938), a mining company (1938), a cotton marketing company (1938), and an engineering company (1939). The capital for these new businesses was supplied by the Nichinan Industry Corporation (*Nichinan Sangyō Kabushiki Gaisha* = ***Companhia Industrial Japão-América do Sul S.A.***) in Japan which, in turn, was created by the National Federation of Emigration Cooperatives in 1937. The projects

of Brazil Development and Colonization Cooperative Ltd. realized what had been the vision of two other frustrated enterprises in the Brazilian Amazon: the Japanese Plantation Company of Brazil (***Companhia Nipônica de Plantação do Brasil S.A.*** = *Nantaku* [*Nanbei Takushoku Kabushiki Gaisha*]) at Tomé-Açu, Pará; and the Amazon Industry Corporation (***Companhia Industrial Amazonense S.A.*** = *Amazônia Sangyō Kabushiki Gaisha*) in Parintins, Amazonas (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991). The Brazil Development and Colonization Cooperative Ltd. operated for 30 years, until 1959.

After the Japanese government manifested a serious comittment to emigration, the plutocrats of *zaibatsu* also started investing in Brazilian farming projects. Japanese immigrants were hired on as farm workers and managers. The Nomura Company acquired 3,300 ha at Bandeirantes, Paraná in 1926. Mitsubishi founded Tozan Farm (***Companhia Agrícola Tozan*** = *Tōzan Nōji Kabushiki Gaisha*) in 1927, and purchased 3,900 ha of coffee plantations at Campinas, São Paulo. The Japan-Brazil Development & Colonization Corporation (*Nippaku Takushoku Kabushiki Gaisha*) of Kawanishi also bought 1,220 ha of land at Avanhandava, São Paulo, in 1927. The Nomura Trading Company (*Nomura Bōeki*) developed 730 ha of coffee plantations at Cornélio Procópio, Paraná, in 1931. The two

Japanese agricultural development projects in the Amazon, mentioned above, began in this period backed up by *zaibatsu* capitalists (see Chapter 3). *Zaibatsu* also entered both the banking (1932) and trading (1935) sectors in Brazil, facilitating Japanese immigrants to establish in agriculture and agro-industries. In 1935, the Japanese government dispatched a business mission to Brazil (*Hirao Mission*), headed by Hachisaburō Hirao (1866-1945). In its consequence, the *zaibatsu* trading companies increased Brazilian cotton import to Japan, that saved Japanese immigrants suffering from the flat coffee market.

The 1929 World Depression had significant effects on both Brazil and Japan. Brazil experienced a major slump of the coffee market, causing coffee plantation bankruptcies for several years thereafter. The Brazilian government intervened by purchasing all domestic coffee stocks, and burned all lower grade beans after 1931. Establishment of new coffee plantations was forbidden for three years, from 1932 to 1935. Japanese immigrants therefore took up cotton cultivation in the interior.

In Japan, the army tried to divert national economic frustrations by creating the 1931 Manchurian Incident. From 1932 to 1940, about 150,000 agricultural settlers were sent to the puppet state of Manchucuo as colonist militias. The

army simultaneously curtailed Japanese emigration to Brazil. Though the Japanese government was fast losing control over its army, it made no official changes in its emigration policy, for it recognized the importance of continued amity and trade with South America. Japanese immigrants in Brazil represented a bond between the two nations. Brazil, however, was gradually becoming a difficult environment for foreigners.

In 1930, Getúlio Dornelles Vargas (1883-1954) became Brazil's provisional president by revolution. He was finally elected president in 1934, and established a new federal constitution. It included an amendment that limited annual entry of immigrants from a particular nation to 2 percent of the total that had already settled in Brazil during the previous 50 years. This translated into only 2,800 Japanese immigrants per year. The amendment was backed by an anti-Japanese front led by congressman Fidélis Reis, and Dr. Miguel de Oliveira Couto (1864-1934), the president of the Brazilian Academy of Medicine (***Academia Nacional de Medicina***; term 1914-34). Inspired by the strict new immigration laws in North America, these men had campaigned since 1923 to convince the Brazilian public that Japanese were an undesirable race to constitute part of the Brazilian population. The *Hirao Mission* in May-June 1935

was also intended to ease such immigration tensions, that could actually do little. Ultimately, however, President Vargas did not like the 1934 Constitution as a whole, so immigration restrictions were never really enforced on Japanese immigrants.

The same restriction was again included in the 1937 New State (***Estado Novo***) Constitution, through which Vargas became the dictator. By this time anti-Japanese sentiment in Brazil had strengthened, triggered by the Japanese invasion of Manchuria and mainland China. Japanese consulate officials and *Burataku* were concerned about the concentration of Japanese immigrants in São Paulo State (94 percent of the 206,000 Japanese in Brazil in 1940). They worried that this presence might cause uneasiness among local Brazilians, and even affect federal policies.

After 30 years of immigration, Japanese farmers represented 5 percent of all agriculturalists in São Paulo State, and contributed about 17 percent of the state's total agricultural production in 1937 (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991). Mixed farming, producing more than 20 different major agricultural products, insured high productivity and stable growth for the Japanese, even under fluctuating market conditions. Japanese agricultural skills were already well-known

throughout Brazil, and had attracted the attention of other state governments besides that of São Paulo. Some Japanese farmers were therefore transmigrated to Bahia (1937), and to Rio de Janeiro (1938 by Cotia Coop), at the official request of these states. *Burataku* sent new immigrants from Japan to the interior of Rio Grande do Sul in 1936. That year, it also acquired 11,000 ha of land in La Colmena, Paraguay, and sent 8 families from Brazil to be pilot farmers there. By 1941, a total of 740 immigrants had been sent to Paraguay, laying the groundwork for post-World War II Japanese immigration there. Japanese agricultural development projects in the Amazon had begun in a similar fashion after the end of the 1920s, through new immigration of Japanese farming families.

Under ***Estado Novo*** nationalization policy, a new immigration act became law in 1938. All foreign language education became controlled, and all Japanese, German and Italian schools were closed by the end of that year. A new law was enacted to control foreign organizations in Brazil. In 1939, foreign language newspaper inspection began. In 1940, alien registration and the carrying of alien IDs became mandatory. Then, in 1941, foreign language newspapers were banned. All six Japanese language newspaper companies (with total daily circulation of 60,500 in 1938),

and a Portuguese journal for *nisei* Japanese-Brazilians were shut down. Faced with such suppression, many Japanese immigrants went home. Some petitioned the Japanese Consul General in São Paulo to transfer them to Manchuria, so that they could contribute to its agricultural development. Nevertheless, out of 188,985 Japanese immigrants in Brazil before the Pacific War (1941-45), only about 10 percent emigrated out of Brazil (Kokusai Kyōryoku Jigyōdan 1993, Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991). When Brazil cut diplomatic relations with Japan in 1942, all Japanese officials were deported home, leaving immigrant farming families alone and isolated in rural Brazil. From then until 1953 there was no Japanese immigration to Brazil. On the home front, the Japanese army encouraged some 120,000 Japanese to emigrate to Manchuria between 1941 and 1945.

Most Japanese farmers in Brazil could not read newspapers in Portuguese, having had no formal education. Without reliable sources of news, they remained ignorant of the international situation. Contacts between Japanese settlements were also limited by travel restrictions. The speaking of Japanese in public, and even at private home gatherings was forbidden. Japanese living in São Paulo City at Count Sarzedas Street (***Rua Conde de Sarzedas***), Belém, Santos, coastal regions, and near federal borders were all

relocated. From 1942 until 1950, all foreign assets belonging to Axis Alliance countries were frozen. Other large assets of enemy nationals, like agricultural cooperatives, shops, factories, farms and banks, were placed under the supervision of administrators (***interventores***) nominated by the Brazilian government. A certain percentage of bank interest accruing to the accounts of enemy nationals was collected and placed in a war indemnity fund. Enemy nationals were forbidden to buy, sell, or mortgage real property.

However, individual agricultural activities were left free. The Brazilian government recognized agricultural coops as institutions indispensable to a stable domestic food supply, and saved them from liquidation. Major agricultural coops appointed Brazilian representatives, who tried their bests to protect associates' interests. Participation of non-Japanese farmers in agricultural coops founded by Japanese was encouraged. The agricultural sector as a whole grew rapidly during World War II. Silk and peppermint enjoyed especially high prices, as their production was disrupted by warfare in Asia and Europe.

Post-World War II Immigration

When the Axis Alliance was defeated in 1945, the majority of Japanese in Brazil could not understand the nature of what had happened. Four years without consulate officials or Japanese language newspapers had left them with no consistent sources of information. They believed that their homeland of divine rule would certainly win, and that they would be re-settled by the imperial fleet to the Greater East Asia Coprosperity Sphere (*Daitōa Kyōei Ken*) after the war, leaving behind their alien land of persecution. The news of Japan's defeat passed by word of mouth caused many to faint. Shock then turned to suspicion, and Japanese encouraged each other not to believe the 'false' information of an enemy conspiracy. Some groups published forged news in Japanese language, claiming that Japan had actually won the war, and that its fleet was heading to Brazil to take immigrants back home. Simple people believed this fantasy, and exchanged money for then valueless old Japanese banknotes. False Japanese princes and military officer impersonators circulated around Japanese settlements doing 'fund raising.' The Japanese community was split into Winner Group (*Kachigumi* = ***Vitoristas***) or Convinced Party (*Shinnenha* = ***Convictos***), and Loser Group (*Makegumi* = ***Derrotistas***) or Recognized Party

(*Ninshikiha* = ***Esclarecidos***). Most Japanese were *Kachigumi* in the beginning, and continued to expound their 'conviction' through magazines and newspapers until 1956. Among these, the Loyalist League (*Shindō Renmei*) was the largest organization, having some 20,000 member families (100,000 people) in 1945. It undertook terrorism against *Makegumi* leaders between March of 1946 and January of 1947. A total of 23 people were killed and 86 injured on both sides.

Shindō Renmei members even traveled across the Andes to Peru, where they were zealously welcomed by local *Kachigumi* people. The Japanese immigrants there had been harshly treated since 1899. During the War, the Peruvian government arrested 1,771 of them and shipped them to Crystal City, Texas, to serve as exchange hostages for the US citizens in Japan (Tsuji 1993). This accounted for 78% of 2,264 Japanese POWs gathered from 13 Central and South American countries (Paulista Shinbun 1996). The Japanese in Peru thus bred hard 'conviction,' which pleased the *Shindō Renmei* fund-rasers, but courted further oppression on themselves. The series of such incidents gained world attention, and caused resentment by Brazilian citizens of Japanese.

As time passed, more Japanese accepted the reality. They understood that Japan was reduced to rubbles by the US

bombing, and had no room left for them to return home. Japan already supported more than 6,100,000 repatriates (3,100,000 civilians and 3,000,000 military personnel), returning from Asia and the Pacific. At its peak, unemployment was approximately 14,000,000. The nation was starving. Only a few repatriates were resettled on marginal public lands such as steep mountain slopes (*Sengo Kaitakuchi*).

As for the *nisei* in Brazil, having been deprived of basic Japanese language education since 1938, they had become acculturated Brazilian adults. The *issei* realized that their adopted country (*yōkoku*) had now become the mother country (*bokoku*) of their children. They finally made the decision to become the soil of Brazil (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991). Some of them were already looking ahead, preparing for the arrival of new immigrants from Japan. This would revitalize the Japanese community in Brazil, and provide Japan with an outlet for its excessive population.

At the end of World War II in 1945, Getúlio D. Vargas resigned the Brazilian presidency. Brazilian citizens had been stifled by the ***Estado Novo***, and wanted democratic change. In 1946, a new Constitution was established. Congressman Miguel Couto Filho, the son of Dr. Miguel de

Oliveira Couto, took a strong position, stipulating a constitutional article to prohibit Japanese immigration. This occurred during the confusion of the 'Winner-Loser' struggle within the Brazilian Japanese community. On August 27, 1946, after a series of heated debates, Proposal No. 3165 was voted on in a plenary session of the Constituent Assembly. The votes tallied 99 to 99, upon which Chairman Fernando de Mello Viana (1878-1954: Vice President 1926-30) voted to break the tie. Most Japanese in Brazil never knew what had nearly happened. Fortunately, this proposal's defeat left open the opportunity for Japanese post-war immigration to Brazil.

When Getúlio D. Vargas was re-elected President in 1951, two men personally asked him for permission to allow further Japanese immigration to Brazil. Kotarō Tsuji (1903-70), the founder of the Amazonian jute industry, was then living in Santarém, Pará. He met Vargas at Parintins in 1940, when the president stopped to see jute production during a campaign visit. Yasutarō Matsubara (1892-1961), a farm owner at Marília, São Paulo, became a supporter of Vargas after he left office in 1945. Matsubara's family lawyer was a friend of Vargas. Tsuji was given license to bring 5,000 Japanese families to the Amazon in 1951, while Matsubara was permitted to bring 4,000 families to the Northeast and Central-West Regions in 1952. President

Vargas imposed the condition that these men cooperate with his national development projects, and locate immigrants in federal or state settlements in the interior.

Two official documents were signed on July 1, 1957, by Francisco Antônio de Toledo Piza, the first president of the National Institute of Immigration and Colonization (***INIC*** [***Instituto Nacional de Imigração e Colonização***]; term June-July, 1954) and Akira Ōtani (1906-?), Rio de Janeiro Branch Director of the Federation of Overseas Associations of Japan (*Kaikyōren* [*Zaidan Hōjin Nihon Kaigai Kyōkai Rengōkai*] = ***Fundação Federação das Associações Ultramarinas do Japão***), representing Tsuji and Matsubara. Japanese called this official contract 'July 1 Agreements' (*Nana-Ichi Torikime*). The quota established there was applied to Japanese independent settlers up until 1965. After Matsubara's death in 1960, Ōtani redirected the previous 'Matsubara Quota' of immigrants to São Paulo and Paraná, while adding an additional 141 families and 32 individuals (called the 'Ōtani Quota'). President Vargas also accepted a plan to admit 200 Japanese sericulturist families to São Paulo State. This plan was submitted by Francisco Antônio de Toledo Piza, the president of São Paulo State Sericulture Society (***Sociedade Paulista de Sericicultura***). This society's membership was 90 percent Japanese sericulturists,

who had made Brazilian sericulture into an export industry during World War II. Annual silk production had reached 500 tons. These members insisted on recruiting new Japanese sericulturists, to improve Brazilian raw silk quality in order to weather the post-war depression. Although there was still strong anti-Japanese sentiment in São Paulo State, the National Council of Immigration and Colonization (***Conselho Nacional de Imigração e Colonização***) authorized the plan in 1953, out of respect for the President. This immigration quota was renewed in 1960 for 500 more families.

In addition, two schemes for immigration of unmarried youths were approved by the Brazilian government: Cotia Youth Immigrants (***Jovens Imigrantes da Cotia*** = *Cotia Seinen Imin*) and Industrial Development Youth Corps (*Sangyō Kaihatsu Seinentai* = ***Grupos de Jovens para o Desenvolvimento Industrial***). In 1955, the INIC allowed the Cotia Agricultural Cooperative to recruit 1,500 unmarried young immigrant farmers from Japan over three years. Another quata of 1,500 people was allowed during a second term. The youths were selected by the Central Union of Agricultural Cooperatives of Japan (*Zenchū* [*Zenkoku Nōgyō Kyōdō Kumiai Chūōkai*]), passed to the Federation of Overseas Associations of Japan (*Kaikyōren*) for emigration, and received by the associates of Cotia Cooperative as their employees. In

1955, the Industrial Development Youth Corps was initiated by the Japanese Ministry of Construction. The young candidates for emigration first received sericulture training in Japan, and were then sent to a local training center in Paraná before becoming independent producers. The Brazilian counterpart of this program was formed in 1957, by the initiative of Cotia Coop., as the Central Association of Colonization Agricultural Cooperatives of the State of São Paulo (***Associação Central de Cooperativas Agrícolas de Colonização do Estado de São Paulo*** = *Nōtakukyō* [*São Paulo Shū Nōgyō Takushoku Kyōdō Kumiai Chūōkai*]). By 1965, a total of 301 people had immigrated to Brazil under this program.

All the above post-war immigration projects were categorized by the Brazilian government as Planned Immigration (***Imigração Planejada*** = *Keikaku Ijū*), and considered to be outside the 2 percent immigration quota stipulated in the Constitution of 1934. This 2 percent quota was applied to Free Immigration (***Imigração Livre*** = *Jiyū Ijū*), started in 1953. In this category, there were two types of 'called' immigrants: 'called by close relatives' (***chamados de parentes próximas*** = *kinshin yobiyose*), and 'personally committed to become farm employees or share-croppers' (***chamados na condição de***

lavradores empregados ou parceiros = *koyōnō moshikuwa buaisakunō shimei yobiyose*). These two types of free immigrants comprised more than 50 percent of all Japanese immigration to Brazil after World War II (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991). A unique nationwide initiative among Japanese college students, called the Japanese Students Alliance for Emigration Overseas (*Gakuiren* [*Nihon Gakusei Kaigai Ijū Renmei*]) was organized in 1955. Its members were sent chiefly as farm leaders to Brazil, including the Amazon, and other Latin American countries (Nihon Gakusei Kaigai Ijū Renmei 1966, Gotō 1986). By 1992, a total of 53,647 Japanese post-war immigrants had entered Brazil, to settle there permanently (Kokusai Kyōryoku Jigyōdan 1993).

In postwar Japan, the government readopted permanent emigration as a national policy, and established the Federation of Overseas Associations of Japan (*Kaikyōren* [*Zaidan Hōjin Nihon Kaigai Kyōkai Rengōkai*] = ***Fundação Federação das Associações Ultramarinas do Japão***) in 1954. *Kaikyōren* was a public-service corporation under the supervision of the Japanese Ministry of Foreign Affairs. It was designated to manage the emigration process subsequent to prefectural emigrant screening, through embarkation, and oversee immigrant reception at the disembarkation ports of

their final destinations. In 1955, the Japanese Cabinet organized the Emigration Council (*Kaigai Ijū Shingikai*) as its consultative committee. In the same year, the Japanese government incorporated the Emigration Promotion Corporation (*Ijū Shinkō Gaisha* [*Kaigai Ijū Shinkō Kabushiki Gaisha*] = ***Empresa de Fomento de Emigração Ultramarina S.A.***) with a capital of ¥ 175,000,000 (US$ 486,111), that was increased to ¥ 3,300,000,000 (US$ 9,166,667) by 1962. This special corporation borrowed a sum of US$ 10,500,000 from three US banks (National City Bank, Chase Manhattan Bank, and Bank of America) from 1956 to 1962 (repaid by 1965), that was realized by the mediation of John Davison Rockefeller III (1906-78) for the Prime Minister Shigeru Yoshida (1878-1967; term 1946-47 and 1948-54). The corporation created two local agencies in Brazil in 1956: Japan Migration and Colonization Ltd. (***JAMIC-Imigração e Colonização Ltda.*** = *JAMIC Ishokumin Yūgen Gaisha*; capital Cz$ 3,000,000 ≈ US$ 42,000), and Japan Emigration Service Financial Assistance Corporation (***JEMIS-Assistência Financeira S.A.*** = *JEMIS Shin'yō Kin'yū Kabushiki Gaisha*; capital Cz$ 10,000,000 ≈ US$ 139,000). ***JAMIC*** was charged with purchasing land for settlements and farming parcels for immigrants. In 1959, ***JAMIC*** merged local branches of the Federation of Overseas Associations of Japan (*Kaikyōren*), that were providing

services of immigrant reception, agricultural extension, medical assistance, and educational support for Japanese children. ***JEMIS*** specialized in immigrant financing. [Kokusai Kyōryoku Jigyōdan 1988]

In 1960, a new agreement was signed between the Brazilian and Japanese governments, to become effective in 1963. This agreement was to officially regulate Japanese post-war immigration to Brazil, which had been privately initiated before rapprochement between the two countries in 1952. In 1962, the Emigration Council submitted a report to the Japanese Cabinet in which it mentioned emigration as a means of international development cooperation. However, as the Japanese economy recovered, and other developed countries like Canada (1962) and Australia (1978) opened their borders to immigration, fewer Japanese wanted to move to underdeveloped, risky places. The hardship experienced by post-war emigrants in the Brazilian interior and other Latin American countries was well known in Japan. The 1962 report of the Emigration Council recognized this change, and recommended administrative reform. Accordingly, in 1963 the Japan Emigration Service (JEMIS = *Ijū Jigyōdan* [*Tokushu Hōjin Kaigai Ijū Jigyōdan*]) was established, and subsumed its antecedents, the Federation of Overseas Associations of

Japan (*Kaikyōren*) and the Emigration Promotion Corporation (*Ijū Shinkō Gaisha*).

After 1966, immigration passage costs were paid by the Japanese government. In 1974, due to decreases in emigration, the Japan Emigration Service (JEMIS = *Ijū Jigyōdan*) was absorbed by the newly organized Japan International Cooperation Agency (JICA = *Tokushu Hōjin Kokusai Kyōryoku Jigyōdan*). In Brazil, ***JAMIC-Imigração e Colonização Ltda.*** and ***JEMIS-Assistência Financeira S.A.*** operated continuously in spite of the institutional transformation of their mother organization in Japan. In 1979, however, the Brazilian government requested that they both be closed, due to their illegality with respect to the Brazilian Civil Code. Civil code laws prohibited aquisition of immovable property and facilities by a foreign government or its agencies. In 1981, the two companies were closed. ***JAMIC*** handed over its responsibilities for receiving immigrants to the Central Association of Colonization Agricultural Cooperatives of the State of São Paulo (***Associação Central de Cooperativas Agrícolas de Colonização do Estado de São Paulo*** = *Nōtakukyō;* dormant since 1967) in collaboration with the National Federation of Colonization Cooperatives of Japan (*Zentakuren [Zenkoku Takushoku Kyōdō Kumiai Rengōkai]*). ***JAMIC***'s medical and educational

assistance work was taken over by regional associations established by Japanese immigrants in Brazil. ***JEMIS*** passed its financial activities over to ***Banco America do Sul*** (*Nanbei Ginkō*; former ***Casa Bancária Bratac***).

Since 1982, JICA has maintained local branches as annex offices to the Japanese Consulates in Brazil. JICA administrates donations to legal entities founded by Japanese immigrants, as well as other technical cooperation work between Japan and Brazil.

The São Paulo Shimbun (1995) quoted the Japanese Ministry of Foreign Affairs as stating that bilateral international cooperation sent to Brazil in 1992 originated from: 1) Japan US$ 63,000,000; 2) Germany US$ 35,000,000; and 3) Netherlands US$ 16,000,000. Japanese Overseas Development Assistance (ODA) to Brazil in 1992 included technical cooperation through JICA (73.5 percent), and government finance (26.5 percent). JICA supported research projects at Brazilian institutes, such as the Brazilian Enterprise for Research on Agriculture and Cattle Ranching (***EMBRAPA*** [***Empresa Brasileira de Pesquisa Agropecuária***]). The principal media of assistance were equipment donations, sending Japanese scientists and technical experts to Brazil, and inviting Brazilian project counterparts to Japan. Japanese-Brazilian farmers were encouraged to participate in

field experiments, training programs and seminars of local institutes working on such research cooperation projects.

Meanwhile, annual emigration from Japan had decreased to less than 100 persons after 1982. Being freed from its immigrant reception work, *Nōtakukyō* changed its focus to agricultural development and colonization projects for all post-war immigrants in Brazil (***Projetos Notakukyo***) in 1986, which JICA financed through the ***Banco America do Sul***. In Japan, a shortage of labor in all industrial sectors, especially unskilled labor, became conspicuous after 1984. Japanese *issei* and *nisei* Brazilians started ***'dekassegui'*** to Japan, or temporary work away from home after the last half of 1986. This reverse immigration was further stimulated by chronic stagflation in Brazil at that time. Nippaku Mainichi Shinbun (1995) introduced a study indicating that approximately one million Brazilians, including Japanese-Brazilians, emigrated overseas between 1980-90. As of 1995, about 150,000 Japanese-Brazilians were in Japan, sending approximately US$ 2.0 billion home to Brazil each year. It was noted that the commonly believed average transfer of US$ 2,000/month/person should be excessive (for more details see Koyama 1998). However, the estimated total annual transfer to Brazil could still increase considering *issei* (they are Japanese in official statistics) working in Japan, and

transfers not made through banks. The same newspaper (Nippaku Mainichi Shinbun 1997a) cited Brazil's US$ 3.2 billion annual trade deficit and US$ 4.0 billion of annual currency transfers from workers abroad (through banks) in 1995.

In 1995, JICA closed its Emigration Department. Nippaku Mainichi Shinbun (1997b) quoted the Japanese Immigration Bureau as registering 189,781 Brazilian immigrants (excluding those having Japanese passports) in Japan in the first half of 1996, the majority of which immigrated as laborers.

The Japanese-Brazilian Community and Its Contributions to Agriculture

Ethnic Community

Post-war 'Winner-Loser' factions within Brazil's Japanese community were finally presented with an opportunity for reconciliation at the time of the anniversary of the City of São Paulo's establishment. The city was founded in 1554 by Jesuits, followers of Francisco Xavier, who had been the first Catholic missionary to enter Japan between 1549-51. On the occasion of the city's fourth centennial, federal, state, and city governments planned events to advertize Brazil's development to the world. In 1952, the Commission for the Fourth Centennial of the

Founding of São Paulo (***Commissão do IV Centenário da Fundação de São Paulo***) invited all foreign immigrant communities to participate in centennial festivities. In 1953, the Collaborative Commission of the Japanese Community in Brazil for the Fourth Centennial of the City of São Paulo (***Fundação Commissão Colaboradora da Colônia Japonesa Pró-IV Centenário da Cidade de São Paulo*** = *Zaidan Hōjin Seishi Yonhyakunen Saiten Nihonjin Kyōryokukai*) was organized. In 1954, the entire Japanese community in Brazil participated in this celebration through commemorative events and donations, all with great success. In 1955, the Collaborative Commission of the Japanese Community was renamed as the Japanese Cultural Society of São Paulo (***Sociedade Paulista de Cultura Japonesa*** = *São Paulo Nihon Bunka Kyōkai*), in preparation for the 50th anniversary of Japanese immigration to Brazil in 1958. In 1968, it was again renamed the Japanese Cultural Society of Brazil (***Sociedade Brasileira de Cultura Japonesa*** = *Bunkyō [Brazil Nihon Bunka Kyōkai]*). This organization represented the national union of more than 500 local and regional Japanese-Brazilian societies: an affiliate was commonly named Japanese Society/Association (***Sociedade/Associação Japonesa*** = *Nihonjin Kai*) or Japanese-Brazilian Cultural Society/Association (***Sociedade/Associação Cultural Nipo-***

Brasileira = *Nikkei/Nippaku Bunka Kyōkai*). These had roots in pre-War spontaneous groupings called Japanese Associations, which served as autonomous authorities in Japanese settlements. The original function of these associations were gradually assumed by Brazilian municipal administrations. Today, these associations deal solely with cultural affairs, as well as some of the tasks relinquished by ***JAMIC***, like Japanese language education and JICA-subsidized agricultural extension.

The Collaborative Commission of the Japanese Community in Brazil for the Fourth Centennial of the City of São Paulo gave birth to another central organization in 1956 called the Brazil-Japan Cultural Alliance (***Aliança Cultural Brasil-Japão*** = *Nippaku Bunka Fukyūkai*; changed Japanese name to *Nichibunren* [*Nippaku Bunka Renmei*] in 1978). This organization was created at the suggestion of Brazilian representatives in the Commission for the Fourth Centennial of the Founding of São Paulo, to promote continuous cultural exchange programs between Brazil and Japan. Seventy percent of the Alliance's founding members were non-Japanese Brazilians, while the rest were mostly *nisei* Japanese-Brazilians. Alliance activities include language courses of Brazilian-Portuguese and Japanese, seminars and exhibitions on Brazilian and Japanese cultures, fellowships for

researchers and training programs, book and audio-vidual libraries, etc.

After World War II, many Japanese organizations were reestablished or newly founded, and encompassed foci like: settlement/community affairs, education and culture, medical care and social welfare, mutual assistance and friendship, sports, art and hobbies, professional groups, and religion (Table 2-3). It was joked that if three Japanese in Brazil got together, they would make an association (Brazil Nihon Imin Hachijonen-shi Hensan Iinkai 1991). However, few organizations founded before World War II survived the ***Estado Novo*** Period, with the exception of agricultural cooperatives and welfare societies. Today, many Japanese-Brazilian individuals and families are simultaneously affiliated with several organizations, which offer them reliable and culturally appropriate facilities and services. Such multiple membership affirms and insures integration of the Japanese-Brazilian community (commonly mentioned as ***'Colônia'***), through overlapping and interwoven ethnic networks. However, as the boundaries of ***'Colônia'*** become obscured by extra-community marriage and acculturation, or by political changes, some organizations have expanded to include non-Japanese-Brazilian members, while aging *issei* remain the only members of others.

Table 2-3. Japanese-Brazilian organizations in Brazil

English Name (translation)	Brazilian Name	Japanese Name
<Settlement/Community Organizations>		
The Japanese Cultural Society of Brazil	Sociedade Brasileira de Cultura Japonesa	Brazil Nihon Bunka Kyōkai -'Bunkyō'
Mato Grosso do Sul State Federation of Japanese-Brazilian Cultural Societies	Federação de Sociedades Nipo-Brasileiras de Cultura de Mato Grosso do Sul	Minami Mashū Nippaku Bunka Rengōkai
North-West São Paulo State Federation of Japanese-Brazilian Cultural Societies	Federação Noroeste de Sociedades Nipo-Brasileiras de Cultura	Noroeste Rengō Nippaku Bunka Kyōkai
Pan-Amazônia Japanese-Brazilian Association - *Belém, Pará*	Associação Pan-Amazônia Nipo-Brasileira	Han-Amazônia Nippaku Kyōkai
Western Amazônia Japanese-Brazilian Association - *Manaus, Amazonas*	Associação Nipo-Brasileira da Amazônia Ocidental	Seibu Amazon Nippaku Kyōkai
Japanese Society/Association or Japanese-Brazilian Cultural Society/Association - *at each settlement*	Sociedade/Associação Japonesa/Cultural Nipo-Brasileira	Nihonjin Kai/Nikkei Bunka Kyōkai
Other regional organizations in Recife (Pernambuco), Salvador (Bahia), Rio de Janeiro (Rio de Janeiro), and Porto Alegre (Rio Grande do Sul) The Amazonian states have the following Japanese Societies/Assiciations: Acre: Acre (in Rio Branco) Amapá: Amapá (in Macapá) Amazonas: Cachoeira Grande (in Manaus), Efigênio Salles (in Manaus), and Sol Nascente (in Manaus) Maranhão: Maranhão (in São Luis) Pará: Abaetetuba, Acará, Altamira, Belém, Benevides, Capitão Poço, Castanhal, Coqueiro (in Belém), Guamá (at Inhangapi), Igarapé-Açu, Monte Alegre, Nova Timboteua, Santa Isabel do Pará e Santo Antônio do Tauá, Santa Maria do Pará, Santarém, Tapanã (in Belém), and Tomé-Açu Rondônia: Ariquemes, Porto Velho, and Treze de Setembro (in Porto Velho) Roraima: Boa Vista		
<Educational and Cultural Organizations>		
Brazil-Japan Cultural Alliance	Aliança Cultural Brasil-Japão	Nippaku Bunka Renmei - 'Nichibunren'
Japanese Language Study Center	Centro de Estudos de Língua Japonesa	Nihongo Fukyū Center
Northern Brazil Japanese Language Study Center	Centro de Estudos de Língua Japonesa da Amazônia	Hokuhaku Nihongo Fukyū Center
São Paulo Friends of Students Society Harmony Student Dormitory	Sociedade Amigos dos Estudantes de SP Casa de Estudantes Harmonia	São Paulo Gakusei Kai Harmonia Gakusei Ryō

Table 2-3--continued

English Name (translation)	Brazilian Name	Japanese Name
Japanese-Brazilian Study Center	Centro de Estudos Nipo-Brasileiros	São Paulo Jinmon Kagaku Kenkyūsho - 'Jinmonken'
Piratininga Culture & Sports Association (*nisei*)	Associação Cultural e Esportiva Piratininga	Piratininga Bunka Taiiku Kyōkai
Associaiton of Ex-Students in Japan (*nisei*)	Associação de Ex-Estagiários no Japão	Nihon Ryūgakusei Kai
Brazilian Association of Technical Studies in Agriculture Kiyoshi Yamamoto Prize - *for producers and technicians contributed to agricultural technology development in Brazil (1965-)*	Associação Brasileira de Estudos Técnicos de Agricultura - ABETA Prêmio Kiyoshi Yamamoto	São Paulo Nōgyō Gijutsu Kenkyūkai Yamamoto Kiyoshi Shō
Brazilian Association for International Colaboration in Agriculture - *agricultural training programs for youth in the US / Japan*	Associação Pró-Colaboração Internacional de Agricultura do Brasil	Brazil Kokusai Nōyūkai
Amazonian Association for International Colaboration in Agriculture- *agricultural training programs for youth in California, US*	Associação Pró-Colaboração Internacional de Agricultura da Amazônia	Amazônia Kokusai Nōyūkai
<Medical Care and Social Welfare Organizations>		
Amazônia Jap.-Brazilian Beneficence Society Amazônia Hospital - Belém Amazônia Hospital of Quatro Bocas - T.-Açu Social Rehabilitation Center - Belém - *for the aged*	Beneficência Nipo-Brasileira da Amazônia Hospital Amazônia Hospital Amazônia de Quatro Bocas Centro de Rehabilitação Social	Amazônia Nippaku Engo Kyōkai-'Enkyō' Amazônia Byōin Tomé-Açu Jūjiro Byōin Kōsei Hōmu
São Paulo Jap.-Brazilian Beneficence Society Japanese-Brazilian Friendship Hospital Emergency Hospital F. Xavier Sanatorium - Campos do Jordão Suzano Ipelândia Rest Home Santos Soc. Rehabilitation Home - *for the aged* Guarulhos Social Rehabilitation Center - *for mentally diseased*	Beneficência Nipo-Brasileira de São Paulo Hospital Nipo-Brasileiro Ambulatório Medico Sanatório São Fransisco Xavier Casa de Repouso Ipelândia de Suzano Casa de Rehabilitação Social de Santos Centro de Rehabilitação Social de Guarulhos	São Paulo Nippaku Engo Kyōkai-'Enkyō' Nippaku Yūkō Byōin Kyūkyū Byōin Fransisco Xavier Kekkaku Ryōyōjo Suzano Ipelândia Hōmu Santos Kōsei Hōmu Guarulhos Yasuragi Hōmu
Japan Beneficence Association - *free diagnosis and treatment for the poor*	Associação Beneficente do Japão	Nihon Jizen Kyōkai

Table 2-3--continued

English Name (translation)	Brazilian Name	Japanese Name
Humanist Beneficence Society - *for Hansen's disease*	Sociedade Beneficente Humanista	Humanista Jizen Kyōkai
Paulista Child Care Association Children's Home - *for mentaly retarded*	Associação Pró-Excepcionais Kodomo-no-Sono	Paulista Jidō Ryōgo-kai Kodomo-no-Sono
Home of Hope Beneficence Society - *for mentally retarded children*	Sociedade Beneficiente Casa da Esperança	Kibō-no-Ie Fukushi Kyōkai
Dom José Gaspar Social Assistance Society Old People's Home 'São Francisco Xavier Rest Garden'	Assistência Social Dom José Gaspar Jardim de Repouso São Francisco Xavier	Seishi Catholic Nihonjin Kyūsai-kai Yōrōin 'Ikoi-no-Sono'
Central Old People's Home	Central Rôjin Home	Central Rōjin Hōmu
Ogata Old People's Home - *for the sick aged*	Casa de Repouso Ogata	Ogata Hōmu
Paraná Welfare for The Aged Society 'Wajun Kai' - *poor lone old people's home*	Wajunkai	Wajun Kai
<Mutual Assistance and Friendship Organizations>		
Federation of Prefectural Immigrant Associations	Federação das Associações de Províncias	Brazil Todōfukenjin Kai Rengōkai - 'Kenren'
Prefectural Immigrant Association	Associação de Província	Kenjin Kai
The Association of Cotia Youth Immigrants	Associação de Imigrantes Jovens da Cotia	Cotia Seinen Renraku Kyōgikai
The Association of Industrial Development Youths	Associação Juvenil de Desenvolvimento Industrial	Sangyō Kaihatsu Seinen Kyōkai
The Industrial Immigrant Association of Brazil - *of post-War industrial engineer immigrants*	Associação de Imigrantes Industriais do Brasil	Kōgyō Ijūsha Kyōkai
Tokyo University of Agriculture Graduates Association	Associação de Ex-Alunos da Faculdade de Agronomia de Tokyo	Brazil Nōdai Kai
Others include: Dōkō-kai - *a group of immigrants who came to Brazil in the same ship;* Dōsō-kai (OB kai) - *a group of graduates from the same school e.g.* Kōtaku-kai; and Dōkyō-kai - *a group of neighbors at home village in Japan.*		
<Sports Organizations>		
Até a Vista Association - *track-and-field sports*	Associação Até a Vista	Até a Vista Kai
Brazilian Federation of Kendo	Federação Brasileira de Kendô	Zenpaku Kendō Renmei

Table 2-3--continued

English Name (translation)	Brazilian Name	Japanese Name
Paulista Federation of Baseball	Federação Paulista de Beisebol	Seishū Yakyū Renmei
Paulista Federation of Judo	Federação Paulista de Judô	Paulista Jūdō Renmei
Brazilian Federation of Sumo	Federação Brasileira de Sumô	Zenpaku Sumō Renmei
Karate Society	Sociedade de Karatê	Karatedō Kyōkai
Aikido International South America Branch	Filial da América do Sul de Aikidô Internacional	Kokusai Aikidō Nanbei Shibu
Others include: Ping-Pong, Tennis, Golf, etc.		
<Art and Hobby Organizations>		
Japanese-Brazilian Federation of Fine Arts	Federação Nipo-Brasileira de Belas Artes	Nippaku Bijutsu Renmei
Applicated Arts & Artists Society	Sociedade de Artistas e Artes Aplicadas	Kōgei Sakka Kyōkai
Japanese Brazilian Society of Music	Sociedade Nipo-Brasileira de Música	Nippaku Ongaku Kyōkai
Paulista Orchid Society	Sociedade Paulista de Orquídeas	São Paulo Ran Kyōkai
Haikist Society of Brazil	Sociedade de Haijin do Brasil	Brazil Haijin Kyōkai
Many others include: go, shōgi - Japanese chess, rōkyoku, yōkyoku, min'yō - Japanese folk songs, shigin, odori - Japanese dances, theater, music, haiku, senryū, tanka, chanoyu - tea ceremony, ikebana - flower arrangements, photography, Japanese cooking, etc.		
<Professional Organizations>		
Mutual Assistance Society of Brazil - *juridical consultation for small businesses*	Sociedade de Assistência Mútua do Brasil	Brazil Sōgo Kyōkai
São Paulo State Association of Cleaners and Dyers	Associação Paulista de Tintureiros	Paulista Sensen Gyōsha Kyōkai
Marketeers Associaiton	Associação de Feirantes	Feirante Kyōkai
Commerce and Industry Association of Liberdade	Associação de Comércio e Indústria da Liberdade	Liberdade Shōkō-kai
Pará Japanese-Brazilian Chamber of Commerce and Industry	Camara de Comércio e Indústria Nipo-Brasileira do Pará	Pará Nikkei Shōkō Kaigisho
Amazonas Japanese-Brazilian Chamber of Commerce and Industry	Camara de Comércio e Indústria Nipo-Brasileira do Amazonas	Amazonas Nikkei Shōkō Kaigisho
Aviculture Society	Sociedade de Avicultura	Yōkei Kyōkai

Table 2-3--continued

English Name (translation)	Brazilian Name	Japanese Name
Multipurpose Agricultural Cooperative - *in various settlements and regions*	Cooperativa Agrícola Mista	Sōgō Nōgyō Kyōdō Kumiai
Multipurpose Agricultural Cooperatives include: Cooperativa Agrícola de Cotia - Cooperativa Central (Cotia Sangyō Kumiai Chūōkai) - *in liquidation* Cooperativa Central Agrícola Sul-Brasil (Nanpaku Nōgyō Kyōdō Kumiai Chūōkai) - *in liquidation* *(former branches of the above two central unions are becoming independent agricultural cooperatives)* Other Coops are: Cafelândia, Aliança, Tietê, Bastos, Marília, Mirandópolis, Ourinhos - São Paulo; Campo Grande - Mato Grosso do Sul; Ivoti - Rio Grande do Sul		
There are five Japanese-Brazilian Agricultural Cooperatives in the Amazon: Cooperativa Agrícola Mista Amazônica Ltda. - Castanhal, Pará (Amazônica Nōgyō Kyōdō Kumiai) Cooperativa Agrícola Mista de Efigênio Salles Ltda. - Manaus, Amazonas (Efigênio Salles Nōgyō Kyōdō Kumiai) Cooperativa Agrícola Mista Paraense Ltda. - Santa Isabel do Pará, Pará (Paraense Sōgō Nōgyō Kyōdō Kumiai) Cooperativa Agrícola Mista de Tomé-Açu - Tomé-Açu, Pará (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai) Cooperativa Integral de Reforma Agrária de Monte Alegre - Monte Alegre, Pará (Monte Alegre Nōgyō Kaihatsu Sōgō Kyōdō Kumiai)		
<Religious Organizations>		
Buddhist Temples	Budistas	Bukkyōkai
Shintoist Shrines	Xintoístas	Shintō Kyōdan
New-Religion Groups	Seitas Diversas	Shinkō Shūkyō Kyōdan
Christian Churches	Católicos e Protestantes ou 'Crentes'	Kirisuto Kyōkai
Religious Sects include: Buddhism: Jōdo-shū, Jōdo Shinshū, Nichiren-shū, Shingon-shū, Sōtō-shū, etc. Shintoism: Shrines of various natual and human objects, e.g. silkworm, Japanese ancient gods, Japanese emperors, relics of indigenous Brazilians, etc. New Religions: Butsuryū-shū, Tenri-kyō, Ōmoto-kyō, Konkō-kyō, Seichō-no-Ie, Sekai Kyūsei-kyō, PL Kyōdan, Sōka Gakkai, Reiyū-kai, Sūkō Mahikari, etc. Christianity: Catholic, Alliance, Episcopal, Holiness, Lutheran, Seventh Day Adventist, Spirit of Jesus, etc.		

Sources: Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai (1991), Kokusai Kyōryoku Jigyōdan (1991), Comissão de Elaboração da História dos 80 Anos da Imigração Japonesa no Brasil (1992), and personal hearings.

The Japanese-Brazilian Beneficence Societies (Table 2-3) deserve special mention as health care organizations. Access to medical care has been a serious concern since Japanese first immigrated to Brazil, especially when immigrant farmers became independent and opened new lands.

They entered interior forests to clear new fields, where they encountered malaria and other fatal tropical diseases. In 1923, using a subsidy from the Japanese Ministry of the Interior (*Naimushō*), the Japanese Beneficence Society in Brazil (***Sociedade Japonesa de Beneficência no Brasil*** = *Dōjinkai* [*Zai Brazil Nihonjin Dōjinkai*]) was founded. Its operations continued until 1973. One year after its founding, in 1924, the Society received a subsidy from the Japanese Ministry of Foreign Affairs (*Gaimushō*). In 1926, the Japanese Beneficence Society in Brazil was officially approved by the Brazilian government. The Society began by dispatching physicians on regular visits to interior settlements, where they distributed anti-viper serum and household medicines at cost, studied and endeavored to exterminate trachoma, malaria and hookworm, opened medical posts in Santos, Lins, Bauru and Presidente Prudente in São Paulo State, opened a tuberculosis sanatorium at Campos do Jordão, and trained auxiliary medical personnel. In 1939, the Society

established the Japanese Hospital (***Hospital Japonês*** = *Nihon Byōin*) in São Paulo City, using donations provided by the entire Japanese community in Brazil, volunteers in Japan, the Japanese government, and the Japanese Imperial Family. That same year, the Japanese Beneficence Society in Brazil changed its official name to Santa Cruz Beneficence Society (***Sociedade Beneficência Santa Cruz***). When diplomatic relations between Brazil and Japan ruptured in 1942, the hospital was entrusted to a Brazilian medical organization, to avoid its requisition by the Brazilian government. It took more than half a century, however, until management of the hospital was fully returned to the Japanese-Brazilian community in the late 1990s. During the 1930's, several smaller medical organizations were created by Japanese immigrants in southern Brazil. Medical facilities were also provided by the settlement development companies like the Brazil Development and Colonization Cooperative Ltd. (***Sociedade Colonizadora do Brasil Ltda.*** = *Burataku*) in São Paulo, the Japanese Plantation Company of Brazil (***Companhia Nipônica de Plantação do Brasil S.A.*** = *Nantaku*) at ***Colônia Acará***, Pará, the Amazon Industry Corporation (***Companhia Industrial Amazonense S.A.*** = *Amazônia Sangyō*) at ***Vila Amazônia***, Amazonas, etc.

In 1959, the Association for Assistance to Japanese Immigrants (***Associação de Assistência aos Imigrantes Japoneses*** = *Enkyō* [*Nihon Imin Engo Kyōkai*]) was formed. This was the year in which post-war Japanese immigration peaked at 7,000 persons. The Association obtained the Santos Immigrant Home (***Casa do Imigrante de Santos*** = *Imin-no-Ie*), provided by the Federation of Overseas Associations of Japan (*Kaikyōren*). From 1960 until 1968, the Association housed immigrants at the Santos facility while they waited for their immigration permits. In 1960, at the request of new immigrants, the Federation of Overseas Associations of Japan entrusted responsibility for physicians' visits to interior Japanese settlements with the Association for Assistance to Japanese Immigrants. The Association also opened a polyclinic in São Paulo City. Apart from health care provision, the Association rendered assistance to immigrants facing personal problems such as impoverishment caused by family illness, joblessness, insanity, alcoholism, and domestic violence. A referral service was started in 1962. In 1965, the Association was entrusted with the Francisco Xavier Sanatorium (***Sanatório São Francisco Xavier*** = *Campos Sanatório* [*Francisco Xavier Kekkaku Ryōyōjo*]) at Campos do Jordão, São Paulo (which was opened by the Japanese Beneficence Society in Brazil in 1936). In 1971,

the Association opened Santos Social Rehabilitation Home (***Casa de Reabilitação Social de Santos*** = *Santos Kōsei Home*) to provide protective care to senior citizens. In 1972, the Association changed its official name to São Paulo Japanese-Brazilian Beneficence Society (***Beneficiência Nipo-Brasileira de São Paulo*** = *Enkyō* [*São Paulo Nippaku Engo Kyōkai*]). In 1977, the Society inaugurated its Guarulhos Social Rehabilitation Center (***Centro de Reabilitação Social de Guarulhos*** = *Guarulhos Yasuragi Home*) for the mentally ill. In 1983, the Suzano Ipelândia Rest Home (***Casa de Repouso Ipelândia de Suzano*** = *Suzano Ipelândia Home*) for the aged was opened. In 1985, the Society founded an emergency hospital, and in 1988, Japanese-Brazilian Friendship Hospital (***Hospital Nipo-Brasileiro*** = *Nippaku Yūkō Byōin*) was established in São Paulo City.

Meanwhile in the Amazon, the Association for Assistance to Japanese Immigrants in the Amazon (***Associação de Assistência aos Imigrantes Japoneses na Amazônia*** = *Enkyō* [*Amazônia Nihon Imin Engo Kyōkai*]) was organized in 1965 in Belém, Pará. It established the Amazônia Hospital (***Hospital Amazônia*** = *Amazônia Byōin*) in Belém in 1969, on the occasion of the 40th anniversary of Japanese immigration to the Amazon. This Association also changed its official name to Japanese-Brazilian Beneficence Society of the Amazon

(***Beneficiência Nipo-Brasileira da Amazônia*** = *Enkyō* [*Amazônia Nippaku Engo Kyōkai*]) in 1974. ***Hospital Amazônia de Quatro Bocas*** (*Jūjiro Byōin*), a branch of the ***Hospital Amazônia***, was opened at Tomé-Açu, Pará in 1978. Besides these facilities, the Association has operated a retirement home called the ***Centro de Rehabilitação Social da Beneficiência Nipo-Brasileira da Amazônia*** (*Kōsei Home*) in Belém since 1986. These '*Enkyō*' Hospitals in São Paulo and Pará have been served by many *nisei* physicians, working jointly with other Brazilian doctors. Most *nisei* doctors care for *issei* patients using Japanese language. They understand *issei*'s sentiments, which calms the fears of the aged expatriates. The '*Enkyō*' hospitals are equipped with advanced medical equipment and instruments, subsidized by JICA, and provide care to all Brazilians.

Another notable organization is the Federation of Prefectural Immigrant Associations (*Kenren*), listed among the mutual assistance organizations in Table 2-3. Before World War II, each prefecture in Japan had an Overseas Association (*Kaigai Kyōkai*) to promote emigration. The Overseas Associations of some prefectures opened settlements in São Paulo State. However, none of those associations maintained local agencies within Brazil to support all immigrants originating from a particular Japanese

prefecture. After World War II, Japan was overburdened with more than 6,000,000 repatriates and 10,000,000 jobless people. The Japanese government urged its prefectures to reorganize their overseas associations. To insure that the emigration process went smoothly and orderly during this sensitive time, prefectures needed local counterparts in Brazil that could supply information about local conditions, send news from established families that had previously emigrated from the prefecture, receive new immigrants, and help them to settle in their new country. By the end of 1950s, Japanese Prefectural Immigrant Associations (*Kenjin Kai*) were organized in Brazil with subsidies from 'mother prefectures' (*boken*) in Japan. Today there are forty-seven Japanese prefecture-based associations in Brazil. Many of these associations have their assembly halls in São Paulo, and other major cities having concentrations of Japanese immigrants. In Pará, there are twenty Japanese Prefectural Immigrant Associations, namely: Akita, Aomori, Chiba, Fukuoka, Fukushima, Gunma, Hiroshima, Hokkaidō, Iwate, Kanagawa, Kōchi, Kumamoto, Mie, Miyagi, Miyazaki, Shizuoka, Tochigi, Tōkyō, Yamagata, and Yamaguchi. Only the Tochigi Prefectural Immigrant Association in the Amazon (*Zai Amazon Tochigi Kenjin Kai*) has a hall in the city of Belém. Since the 1970s, when Japanese immigration declined sharply, the

primary function of these associations has shifted to 1) selection of students and trainees from immigrant families for prefectural fellowships in Japan, 2) organizing home visit missions back to Japan, and 3) receiving and hosting prefectural missions and trainees from Japan.

The Federation of Prefectural Immigrant Associations (*Kenren*) mentioned above was founded in 1966. The original purpose of this Federation was to work with the Federation of Japanese Emigrant Families Associations (*Shadan Hōjin Nihon Kaigai Ijū Kazokukai Rengōkai*) in Japan. The latter organization's members are ex-emigrants who lived in Asia and the Pacific prior to their repatriation after World War II. These repatriated emigrants were given the right to receive pensions from the Japanese government, while those among them who chose to again emigrate overseas were missed due to their absence. The Federation of Prefectural Immigrant Associations became the advocate of post-War Japanese emigrants who resided in Brazil, and were eligible for this pension. This Federation also sent early pioneering, but unfortunate old immigrants for home visits to Japan beginning in 1967, to pay respects to them and their achievements. Since 1972, the Federation of Prefectural Immigrant Associations and the Federation of Japanese Emigrant Families Associations have together been

working to enshrine (*kuyō-suru*) the neglected graves of Japanese immigrants in Brazil. In 1975, a monument was established in Ibirapuera Park, São Paulo City, where the death registers of all prefectural immigrant associations are housed together. Every year on June 18th, the day the ship *Kasato-maru* arrived in Santos in 1908, the memorial ceremony of Japanese Immigrants' Day (***Dia do Imigrante Japonês*** = *Nihon Imin-no-Hi*; established by the City of São Paulo in 1980) is observed at this monument.

Japanese-Brazilian Agriculture

Just before World War II in 1939, one year after the 30th anniversary of Japanese immigration on the *Kasato-maru*, Japanese residents in Brazil numbered 202,211. They accounted for 0.5 percent of Brazil's population. Fully 97.6 percent of these Japanese lived in rural areas and were engaged in agriculture (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991). This was the highest percentage of any group of immigrants involved in Brazilian agriculture (Table 2-4).

By 1958, the 50th anniversary of immigration, the Japanese-Brazilian community census enumerated a total population of 430,135, 0.6 percent of Brazil's population. Agriculture employed 57.2 percent of these Japanese over 10

Table 2-4. Occupational composition of principal nationalities entering Brazil from Santos from 1908 until June, 1941

Country	Farmers (%)	Workers (%)	Others (%)	Total
Portugal	140,176 (47.7)	14,417 (4.9)	138,991 (47.8)	293,584
Spain	164,924 (78.6)	4,773 (2.3)	40,195 (19.2)	209,892
Italy	101,066 (49.0)	22,654 (11.0)	82,336 (40.0)	206,056
Japan	186,228 (98.0)	232 (0.1)	2,030 (1.1)	188,490
Germany	14,385 (30.7)	5,869 (12.3)	26,639 (56.8)	46,893
Turkish Arabs	7,930 (18.0)	891 (2.0)	35,133 (80.0)	43,954
Turkey	2,941 (11.2)	551 (2.1)	22,856 (86.7)	26,348
Rumania	20,369 (84.7)	333 (1.4)	3,339 (13.9)	24,041
Yugoslavia	19,895 (93.1)	216 (1.0)	1,254 (5.9)	21,365
Lithuania	18,249 (86.6)	403 (1.9)	2,417 (11.5)	21,069
Poland	6,746 (39.9)	1,473 (8.7)	8,683 (51.4)	16,912
Austria	9,156 (60.0)	1,525 (10.0)	4,570 (30.0)	15,251
Total	791,135 (59.6)	63,883 (4.8)	472,943 (35.6)	1,327,911

Source: Kawai (1978) in Centro de Estudos Nipo-Brasileiros (1980)

years of age (Comissão de Recenseamento da Colônia Japonesa 1964). The latest census of the Japanese-Brazilian population was done in 1988, on the 80th anniversary of immigration. There were 1,228,000 Japanese, comprising 0.8 percent of Brazil's population. The highest concentration of Japanese, 974,000 or 79.3 percent of them, resided in Brazil's Southeast Region. Fully 887,000 (72.2 percent) Japanese-Brazilians were concentrated in the State of São Paulo, comprising 2.8 percent of the state's population. Brazil's South Region held the second largest number of Japanese-Brazilians, 143,000 or 11.6 percent of all Japanese-Brazilians. Japanese-Brazilians living in the country's Central-West (49,000 or 4.0 percent), Northeast (28,000 or 2.3 percent), and North (33,000 or 2.7 percent)

Regions together total less than one tenth of all Japanese-Brazilians. In the North Region, the Legal Amazon except for Maranhão, Japanese-Brazilians comprised 0.6 percent of the total regional population.

In 1988, about 15.4 percent of all Japanese-Brazilians over 10 years old were engaged in agriculture. This was less than the 24.6 percent of all Brazilians engaged in agriculture in 1987 (Centro de Estudos Nipo-Brasileiros 1990). Though a decrease in the proportion of all Brazilians engaged in agriculture has been a general trend in Brazil over the past 50 years, this decrease has been more rapid among Japanese-Brazilians. This has been due in part to the education given to their children, which has emphasized studies other than agriculture to attain quicker social promotion, such as medicine, law, engineering, business administration, and computer science. From 1978 through the late 1980s, 15 percent of all students enrolled in the State University of São Paulo (***USP*** [***Universidade de São Paulo***]) were Japanese-Brazilians, a figure that had been just 2.5 percent in 1949. Similarly high ratios of 9-17 percent Japanese-Brazilian enrollment were found among other major colleges in the greater São Paulo area in 1978 (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991).

This academic achievement was, in fact, inseparably linked to the rapid growth of São Paulo City, which in turn required a large, sustained supply of food. Japanese immigrants relocated to interior forests, having terminated their coffee plantation contracts, with the unanimous dream of becoming coffee plantation owners. However, since the mid-1910s, many returned to the suburbs, disillusioned by a flat coffee market, natural disasters, quickly degrading soils, and the hazards of interior living. In urban areas they could utilize their inherent skills as horticulturists, while sending their children to school (Table 2-5).

Table 2-5. Principal farm products of Japanese-Brazilian farmers (1912-62)

Year	Suburban Agriculture (%)*[1]	Coffee (%)	Cotton (%)	Others (%)	Japanese Suburban Farms*[2]	Population of São Paulo City*[3]
1912	0.6	92.5	1.2	5.6		239,820 (1900)
1917	4.2	76.8	4.5	14.5	10	
1922	10.2	52.0	12.1	25.7		579,033 (1920)
1927	11.1	62.3	11.1	15.5	134	
1932	13.0	59.0	14.0	14.0		
1937	14.5	32.1	39.0	14.5	583	
1942	19.9	24.3	39.3	16.5		1,326,261 (1940)
1947	27.4	23.6	31.2	17.7	1,465	
1952	34.0	27.5	20.5	18.0		2,198,096 (1950)
1958	42.2	28.3	8.5	21.0	2,488	
1962	39.9	25.1	8.4	26.6		3,781,446 (1960)

Source: Comissão de Recenseamento da Colônia Japonesa (1964)
*[1] Vegetables, Tomatoes, Potatoes, Fruits, Bananas, Poultry, Dairy (N.A. in 1962) and Suburban Polyculture
*[2] Numbers of Japanese Suburban-Agriculturist Families in São Paulo City; based on Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai (1991)
*[3] Population Data from Fundação Instituto Brasileiro de Geografia e Estatística (IBGE; 1992)

Accelerated flows of Japanese immigrants occurred by the Great Depression (1929-30s). Fortunately, there were vast 'waste lands' on the outskirts of cities, abandoned by earlier Portuguese immigrants that had practiced slash-and-burn agriculture (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991). A new practice of Brazilian landowners since the 1910s, sub-dividing lots into ten alqueires (24.2 ha) each, also helped small farmers to obtain lands called ***minifúndios*** (Table 2-6).

Table 2-6. Change of agricultural status of Japanese-Brazilian farmers (1912-62)

Year	Owner	Renter	Share-Cropper	Colono*[1]
1912	5.1	1.9	5.1	88.0
1917	16.1	8.7	9.2	66.1
1922	28.8	25.3	13.3	32.6
1927	26.8	19.7	12.6	40.9
1932	27.7	19.9	15.3	37.0
1937	35.5	33.1	11.9	19.5
1942	44.9	35.8	9.6	9.7
1947	51.2	33.9	8.4	6.4
1952	58.0	29.6	8.3	4.1
1958	64.0	24.8	8.3	2.9
1962	78.3	18.0	3.2	0.5

Source: Comissão de Recenseamento da Colônia Japonesa (1964). Numbers in %. Farm administrators and others are excluded (together make 0.7% of original total in 1962).
*[1] contract laborers of which majority worked for coffee plantations.

Fertilizers were not yet commonly used, but Japanese farmers applied slaughterhouse waste, cut grass laid in stables, and chicken manure to restore soil and increase productivity. According to the São Paulo State Agricultural Department, in 1937 Japanese farmers, approximately 5

percent of the state's agriculturists at that time, contributed 17 percent of the state's total production value (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991). Tamura (1969) wrote that Japanese-Brazilian farmers produced 14.9 tons per hectare (t/ha) of potato compared to 6.1 t/ha among local agricultural counterparts, 44.4 t/ha of tomatoes compared to 14.4 t/ha, and 210 eggs/hen/year compared to 63 eggs/hen/year. The urbanization of São Paulo created not only increased food consumption, but also demand for increased food varieties (Table 2-7) and higher standards of quality. Fresh vegetables and fruits, especially tomatoes, which required intensive cultivation techniques, were largely the products of Japanese farmers (Rios 1968, Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991).

Through both individual and organized efforts, they introduced and developed new crop varieties that have influenced the Brazilian tastes in food (Table 2-8). The dedication of Japanese-Brazilian farmers in supplying perishable foods to domestic markets supported Greater São Paulo's expansion into the largest industrial center in South America (Nogueira 1968). Until recently, these farmers were the major source of vegetables to the Central Vegetable & Fruit Market of São Paulo (***CEAGESP*** [***Companhia de Entrepostos e Armazéns Gerais de São Paulo***]). However,

having had close contacts with city dwellwers, farmers chose to educate their children in ways that could lead them into more affluent lives, unlike their parents who till the soil.

Table 2-7. Japanese-Brazilian agricultural production share in São Paulo State and Brazil (1939-65)

Crop	Yr.1939 (%)*[1]		Yr.1958 (%)*[2]		Yr.1964/5 (%)*[3]
	São Paulo	Brazil	São Paulo	Brazil	Brazil
Bananas	10.00	3.42	21.82	5.33	6.0
Black Pepper	-	-	-	100.00	82.0
Cassava	25.00	0.70	-	-	-
Castor Bean	9.76	1.02	-	-	-
Silk Cocoon	-	-	-	-	80.0
Coffee	6.47	4.15	7.70	5.90	8.8
Corn	5.30	1.30	-	-	2.3
Cotton	60.52	38.59	26.77	11.58	13.7
Eggs	-	-	37.00	11.62	43.8
Feijão Beans	5.00	1.14	-	-	-
Fruits	-	-	-	2.91	-
Jute	-	-	5.92	4.56	-
Peanuts	-	-	42.84	39.05	21.2
Peppermint	-	-	36.36	-	50.0
Potatoes	56.25	10.72	67.90	27.02	41.0
Ramie	-	-	56.05	15.96	91.7
Rice	10.26	3.23	8.11	2.25	4.2
Sugarcane	1.48	0.20	-	-	-
Soybean	-	-	-	-	5.9
Tea	-	-	92.06	-	92.1
Tomatoes	-	-	93.30	61.68	58.1
Vegetables	-	-	-	-	-

Note: % of total production in metric tons except vegetables and fruits in Cz$, bananas in bunches, and eggs in dozens.
*[1] Calculated from Japanese production data of Japanese Consulate in São Paulo (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991) and Instituto Brasileiro de Geografia e Estatística, Conselho Nacional de Estatística (1946). No national and São Paulo State data available for cocoon (200 t), eggs (15,000,000 units), fodder (400 t), fruits (950,000,000 Réis), livestock products (1,500,000,000 Réis), onion (800 t), peanut (15,000 t), tea (250 t), tomato (4,690,000 boxes), and vegetables (3,000,000,000 Réis).
*[2] Commissão de Recenseamento da Colônia Japonesa (1964). Japanese-Brazilian production of fruits was Cz$ 350,445,000 in São Paulo State, and Cz$ 390,676,000 in Brazil. Their vegetable production was Cz$ 1,112,370,000 in São Paulo State, and Cz$ 1,532,381,000 in Brazil. National and state data were not available for comparison.
*[3] Tamura (1969) and Brazil Nihon Imin Nanajūnen-shi Hensan Iinkai (1980); original data from Associação Brasileira de Estudos Técnicos de Agricultura (ABETA).

Table 2-8. Agricultural contribution by Japanese immigrant farmers in Brazil
code: A-acquisition (introduction), B-breeding, C-comercialization, D-technical improvements & diffusion, E-exportation

Crop/Product Name	Major Contributor	Year	Codes	Cultivar/Line Name
<Grains>				
Buckwheat - Trigo Sarraceno (*Fagopyrum sagittatum*)	Jap. farmers	1910s	A,D,E	Japanesc cultivars (Japan)
Ricc - Arroz (*Orysa sativa* var. Matsum)	Jap. farmers	1910s	A,D	Japanese cultivars (Japan)
Sov Bcan - Soja (*Glycine max*)	Shirō Miyasaka	1970s	B,D,E	various cultivars
Others: Peanut - Amendoim, Corn - Milho	Jap. farmers		D,E	
<Vegetables>				
Artichoke - Alcachofra (*Cynara scolymus*)	Jap. farmers at São Roque	1950s	C	(local variety)
Bamboo Shoot - Broto de Bambu (*Phylbstachys* spp.)	Ryōtarō Shimomoto/Masami Yano	1930	A,C,D	Mōsō, Madake, Hachiku (Jap.)
Bell Pepper - Pimentão (*Capsium annuum*)	Jap. farmers at Suzano	1955	B,D	Casca Dura
	Toranosuke Ikeda	1958	B,D	Ikeda
	Kō Watanabe		B,D	Avelar
	Jap. farmers		B,D	various cultivars
Broccoli - Couve-flor (*Brassica oleracea* var. Botrytis)	Yamaguchi/Nakamura Farms		B,D	Rio Grande
	Anraku Farm		B,D	Anraku
	Miyai Farm		B,D	Miyai
	Jap. companies		B,D	various cultivars
Burdock - Bardana (*Arctium lappa*)	Jap. farmers		A,C,D	cultivars (Japan)
Cabbage - Repolho (*Brassica oleracea*)	Jap. farmers	1960s	A,D	Banchū-Risō, Natsumaki-Risō, Habuka, Shiki-dori, Matsukaze (Japan)
	Hiroshi Ikuta	1967	B,D	hybrids of Jap. vars. x Louco
Cabocha - Abóbora Japonesa (*Cucurbita moschafa*)	Jap. farmers	1970s	A,D	Tetsukabuto, Ebisu (Japan)
Carrot - Cenoura (*Daucus carota*)	Hiroshi Ikuta	1960s	B,D	Kuroda Melhorada
	Yoshio Uwasa		B,D	Londrina
Cucumber - Pepino (*Cucumis sativus*)	Jap. farmers	1930s	A,B,D	Aodai (Japan) - produced many
Cucumber - Pepino (*Cucumis sativus*)	Jap. farmers	1960s	A,D	various cultivars (Japan)
Eggplant - Berinjela (*Solanum melongena*)	Hiroshi Ikuta		B,D	Piracicaba 41/100
	Shinohara Farm, etc.		B,D	Embu
Garlic - Alho (*Allium sativum*)	Chōnan Farm, etc.	1977	B,D	Chōnan
Ginger - Gengibre (*Zingiber officinale*)	Jap. farmers		A,D,E	Otafuku, Takahashi, Ōshōga, Indo-Shōga (Japan)
Green Onion - Cebolinha (*Allium fistolosum*)	Jap. farmers		A,D	various cultivars (Japan)
Haricot Bean - Feijão Vagem (*Phaseolus vulgaris*)	Jap. farmers at Cotia		B,D	Rio-Cotia
	CSB*[1]		B,D	Sul-Brasil Campinciro
	Agroflora Company		B,D	Namorada, Senhorita

Table 2-8--continued

Crop/Product Name	Major Contributor	Year	Codes	Cultivar/Line Name
Lettuce - Alface (*Lactuca sativa*)	Yō Nagai		B,D	Brasil-Tipo 48
Nappa - Acelga Japonesa (*Brassica pekinensis*)	Jap. farmers		A,C,D	Taibyō Rokujū-nichi (Japan)
Okra - Quiabo (*Hibiscus esculentus*)	Toshiharu Kunizawa	1948	C	(local variety)
	Toshiharu Kunizawa	1967	B,D	Quiabo Piranema
	Shinobu Sudō		B,D	Santa Cruz 47
Onion - Cebola (*Allium cepa*)	Jap. farmers		D	
Parsnip - Mandioquinha (*Arracacia xanthorrhiza*)	Jap. farmers in São Paulo		B,C,D	various cultivars
Pea - Ervilha (*Pisum sativum*)	Ōkawa Farm/CAC*[2]	1940	B,D	Ōkawa
	Muramatsu Farm	1960	B,D	Muramatsu
	Tsuruga Farm		B,D	Tsuruga
	Jap. farmers in Serrado	1970s	D	cultivars for agric. processing
Potato - Batata (*Solanum tuberosum*)	Jap. farmers at Cotia	1910s	B,C,D	Paraná-Ouro
Raddish Daikon - Rábano (*Rephanus sativus*)	Jap. farmers		A,C,D	Mino-Wase, Kōhai-Natsu-Mino-Wase No.1-3 (Japan)
Taro - Inhame (*Colocasia esclenta*)	Jap. farmers		A,C,D	Tsuchitare, Ishikawa-Wase, Kurojiku (Japan)
Tomato - Tomate (*Lycopersicum esculentum*)	Hanashiro Farm/CAC*[2]	1930s	B,D	Santa Cruz
	CAC*[2]		B,D	CAC-A/B
	CSB*[1]		B,D	Sul-Brasil
	Jap. farmers at Piedade		B,D	Piedade Gigante, Kada
	Samano Farm		B,D	Samano
	Kobayashi Farm		B,D	Kobayashi
	Monma Farm		B,D	Monma
	Yō Nagai		B,D	Santa Elisa, Ângela
	Watanabe Farm		B,D	Miguel Pereira, St°.Antônio, L4
	Yokota Farm		B,D	Yokota Farm
	Ōsawa Farm		B,D	Ōsawa
	Yō Nagai/Watanabe Farm		B,D	Tomate-Caqui cultivars
	Ōishi Farm		B,D	Tomate-Caqui Ōishi
<Fruits and Nuts>				
Acerola - Acerola (*Malpighia glabra*)	Teruo Shimomaebara, etc.	1970s	B,C,D,E	various cultivars
Apple - Maçã (*Malus pumila*)	Kenshi Ushirozawa	1971	A,D,E	Fuji
Avocado - Abacate (*Persea americana*)	Taizō Itō	1958	B,D	Coringa
	CAC*[2]	1972	A,D	cultivars (U.S.A.)
	Makiyama Farm		B,D	Margarida
Chestnut - Castanha (*Castanea crenata*)	Keiichi Matsumoto	1958	A,D	various cultivars (Japan)
Cupuaçu - Cupuaçu (*Theobroma grandiflorum*)	Katsutoshi Watanabe, etc.	1976	B,D,E	(local plant selection)
Grape - Uva (*Vitis vinifera*)	Susumu Usui	1940	D	'Itália'

Table 2-8--continued

Crop/Product Name	Major Contributor	Year	Codes	Cultivar/Line Name
Grape - Uva (*Vitis vinifera*)	Kōtarō Okuyama	1973	B,D,E	Rubī Okuyama
	Jap. farmers		A,D,E	Kyohō (Japan)
Guava - Goiaba (*Psidium guajava*)	Sakuzō Watanabe	1939	C,D	(wild plant domestication)
	Shin'ichi Ogawa		B,D	Santa Alice Melhorada, Ogawa No.1-3
	Kumagai Farm		B,D	Kumagai
	Morinishi Farm		B,D	Morinishi
Japanese Apricot - Umê (*Prunus mume*)	Jap. elders at Botucatu	1960s	D	'Taiwan'
Kiwi - Kiwi (*Actinidia chinenis*)	Jap. farmers	1970s	A,D	(Japan)
Litchi - Lichia (*Litchi chinensis*)	Jap. farmers in São Paulo		D	
Loquat - Nêspera (*Eriobotrya japonica*)	Jap. farmers	1910s	A	Mogui, Tanaka (Japan)
	Jap. farmers		B,D	Itaquera Precoce
	Jap. farmers		A,D,E	Mizuho, Ōfusa (Japan)
Macadamia - Macadâmia (*Macadamia integrifolia*)	Cia. Takasago, etc.	1970s	A,D	Hawaiian varieties
Mammee Apple - Abricó-do-pará (*Mammea americana*)	Gorō Satō/Noboru Ōya	1970s	B,C,D	(local plant selection)
Mangosteen - Mangostão (*Garcinia mangostana*)	Jap. farmers in Baia/Pará	1970s	C,D	
Melon - Melão (*Cucumis Melo*)	Ōnishi Farm/CAC*2	1968	B,D,E	Amarelo CAC
Papaya - Mamão (*Carica papaya*)	Akihiro Shirakibara	1971	A,D,E	'Hawaii,' 'Taiwan'
Peach - Pêssego (*Prunus persica*)	Yoshioka Farm	1920s	B,C,D	Giichi, Taichi, Rosa de Itaquera, No.4011/5014
	Sawabe Farm		B,C,D	Sawabe
Pear - Pêra (*Pyrus communis*)	Jap. farmers		A,C,D	Bansankitsu, Nijusseiki, Shinsui, Kōsui, Chinese & European cultivars (Japan)
Pecan - Pecã (*Carya pecam*)	Masayuki Terabe/Yoshiji Kakihara	1942/48	C	(local varieties)
	Toyohiko Kagawa	1950	A,D	cultivars (Japan)
	Morokawa Farm		B,D	Morokawa No.1-2
Persimmon - Caqui (*Diospyros kaki*)	Matsumoto/Yoshioka Farms	1916/23	A,C,D,E	Fuyū, Jirō, etc. (Japan)
Pineapple - Abacaxi (*Ananas comosus*)	Yoshizō Andō/Toyokichi Imai	1935	A,D	Smooth-Cayenne (Singapore)
Plum - Ameixa (*Prunus salicina/domestica*)	Campinas*3/Jap. farmers	1969	B,C,D	Carmesim
Shaddock - Poncã (*Citrus reticulata*)	Kyūjiro Kuwabara	1929	A,C,D	(Japan)
Strawberry - Morango (*Fragaria chiloensis*)	Keijirō Honda	1946	B,D	Honda
	CSB*1, CAC*2		D	(virus-free plants)
Watermelon - Melancia (*Citrullus vulgaris*)	Jap. farmers		A,D	Daimaru Yamato, New
<Condiment and Recreation Crops>				
Allspice - Pimenta-da-jamaica (*Pimenta officinalis*)	Jap.farmers at Teixeira de Freitas	1980s	A,D	(Jamaica)
Black Pepper - Pimenta-do-reino (*Piper nigrum*)	Cia. Nipônica*4/Makinosuke Usui	1933	A	'Singapura' (Singapore)
	Tomoji Katō/Enji Saitō	1935	D,E	'Singapura' (Singapore)

Table 2-8--continued

Crop/Product Name	Major Contributor	Year	Codes	Cultivar/Line Name
Clove - Cravo-da-índia (*Caryophyllus aromaticus*)	Kiyoshi Yogo	1950s	D,E	(local variety)
Tea - Chá (*Thea assamica*)	Torazō Okamoto	1934	A,C,D,E	'Assam' (Sri Lanka)
Others: Coffee - Café, Guaraná - Guaraná, Peppermint - Hortelã, Sugarcane - Cana-de-açúcar	Jap. farmers		D,E	
<Fiber Crops>				
Jute - Juta (*Corchorus capsularis*)	Inst. Amazônia*[5]	1930	A	cultivars (India)
	Ryōta Oyama/Inst. Amazônia*[5]	1933	B,C,D,E	Oyama
	Jap. Farmers/IAN*[6]		B,C,D,E	Bambu, Roxa, Tanaka
Ramie - Rami (*Boechmeria nivea*)	Seiki Murakami	1938	A,B,D,E	Murakami
	Heikichi Matsui	1938	A,D,E	Taiwan-Taikei (Malaysia)
Rush - Junco (*Juncus deeipens*)	Shigeru Yoshimura	1931	A,C,D	(Japan)
Others: Cotton - Algodão, etc.	Jap. farmers		D,E	
<Flower and Ornamental Plants>				
Gladiolus	Hatsuo Ishibashi	1952	A,D	(Holland)
Carnation, Chrysanthemum	Haruju Matsuoka	1954	A,D	(Uruguay)
	Hatsuo Ishibashi	1958	A,D	(Argentina)
Acer, Azalea, Bamboo, Camellia, Fatsia, Ginkgo, Guerria, Japan Cedar, Nandina, Pine, Rose	Hatsuo Ishibashi	1958	A,D	(Japan)
Various other ornamental plants	Jap. farmers		A	(Japan)
<Livestock Industry>				
Sericulture - Sericicultura	Jirō Satō/Toyozō Ono	1914/19	D	(local silkworm/mulberry)
	Bratac Filature	1938	A,B,D	silkworm eggs (Japan)
	Bratac Filature	1967	D,E	
Poultry (ovum collection) - Avicultura (coleção de ovos)	Ken'ichi Nakagawa	1935	B,D	300 egg layers
	Yōkei-Fukyūkai/KTK Kyōkai	1937/39	A,D	breeding stocks (Japan)
	Itō Stock Breeder, etc.	1962/63	A,D	Hy Line, Kimber, Shaver, Babycock (US)
	Jap. stock breeders	1969	A,D	Iwaya, Gotō, En'ya (Japan)
Pisciculture (rainbow trout) - Piscicultura (truta)	Kiyoshi Koike	1970s	D	
Others: Koi, Shrimp, Tortoise, Frog, Alligator, etc.	Jap. pisciculturists		D	

Source: Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai (1991), Comissão de Elaboração da História dos 80 Anos da Imigração Japonesa no Brasil (1992), and personal communications.

*[1] CSB = Sul-Brazil Coop. (***Cooperativa Central Agrícola Sul-Brasil***)

*[2] CAC = Cotia Coop. (***Cooperativa Agrícola de Cotia-Cooperativa Central***)

*[3] Campinas = Campinas Agronomic Institute (***Instituto Agronômico de Campinas***), São Paulo

Table 2-8--continued

*[4] Cia. Nipônica = Japanese Plantation Company of Brazil (***Companhia Nipônica de Plantação do Brasil S.A.***)

*[5] Inst. Amazônia = Amazônia Institute (***Instituto Amazônia;*** later ***Companhia Industrial Amazonense S.A.***)

*[6] IAN = Northern Agronomic Institute (***Instituto Agronômico do Norte;*** current *CPATU*)

Only the following names are not farmers:
Akihiro Shirakibara (Tenri-kyō missionary, Japan)
Hiroshi Ikuta (Piracicaba Agricultural College = ***Escola Superior de Agricultura Luiz de Queiroz de Piracicaba,*** São Paulo)
Kenshi Ushirozawa (Japan International Cooperation Agency)
Makinosuke Usui (immigrant shipping director of the Japanese Plantation Company of Brazil)
Shirō Miyasaka (Campinas Agronomic Institute, São Paulo)
Toyohiko Kagawa (agricultural cooperative movement leader in Japan)
Yō Nagai (Campinas Agronomic Institute, São Paulo)

The economic prosperity of suburban Japanese-Brazilian farmers was aided by multipurpose agricultural cooperatives, first organized in the 1920s. They were modeled after the 'Sangyō Kumiai' (Production Union) in Japan. Facing exploitative middlemen and difficulties in transportation and storage of perishables, Japanese farmers united themselves through traditional community principles of mutual help. Both technical and some financial assistance were provided by the Japanese Consulate General in São Paulo in order to establish agricultural cooperatives. These cooperatives sponsored various joint activities apart from the sale of produce, including: agricultural material purchasing, food processing, credits, research, and extension. Extension has been particularly important in diffusing new crop varieties and associated cultural techniques to coop members, in order to make their products attractive in the marketplace (see Table 2-8). Cooperatives were also responsible for encouraging intensive, mixed farming in remote areas due to their integrated services to members. This multipurpose cooperative model was subsequently adopted by the Brazilian government as the ***'Cooperativa Mista'*** concept, which has been promoted through government rural development projects.

Of the many Japanese-Brazilian cooperatives, two giants emerged, namely: the ***Cooperativa Agrícola de Cotia-Cooperativa Central*** and ***Cooperativa Central Agrícola Sul-Brasil***. The Cotia Coop. was asked by the Brazilian government to establish a model project as a part of the new Cerrado agriculture. This led to Cotia Coop.'s participation in the Upstream Paranaíba River Agricultural Development Project (***PADAP*** [***Projeto Agrícola de Desenvolvimento do Alto Paranaíba***]) at São Gotardo, Minas Gerais, beginning in 1974. Its success was followed by the Cerrado Development Plan I & II (***Prodecer*** [***Plano de Desenvolvimento do Cerrado***] ***I, II***) after 1978, in which both Cotia Coop. and Sul-Brasil Coop. played important roles. By 1988, Cerrado agriculture was producing 45 percent of Brazil's soy beans, 36 percent of its corn, 47 percent of its rice, and approximately 40 percent of its coffee (Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991).

Cotia Coop. pioneered in apple plantations at São Joaquim, Santa Catarina, beginning in 1973. This effort has boosted Brazil's domestic supply of high-quality apples, and reduced imports. Cotia Coop. has also participated in the São Francisco River Valley Development Plan (***Plano de Desenvolvimento do Vale do Rio São Francisco***) since 1979. It has established irrigated fruticulture at Pirapora, Minas

Gerais and Curaçá, Bahia. Grapes, papayas, mangoes, and melons have all been exported to Europe from this project.

As a result of participating in these national-profile projects, and with the backing of their affiliated cooperatives, Japanese-Brazilian farmers have further modified their intensive farming skills into larger operational scales using modern technology. This technical adaptation can be credited, in part, to the training of young core farmers in California, USA, starting in 1964. The Brazilian Association for International Colaboration in Agriculture (***Associação Pró-Colaboração Internacional de Agricultura do Brasil*** = *Brazil Kokusai Nōyūkai*) has sponsored these trainings, with the support and leadership of the two giant cooperatives mentioned above. Participants to these training have also originated from the Amazon. Upon their return, these participants organized their own independent Association (***Associação Pró-Colaboração Internacional de Agricultura da Amazônia*** = *Amazônia Kokusai Nōyūkai*) in 1979, supported by local cooperatives from Tomé-Açu, Santa Isabel do Pará, Castanhal, and Monte Alegre.

The two giant cooperatives (central unions) dissolved in 1994, when they failed to survive a difficult period of Brazilian hyper-inflation, high interest rates in agricultural credits, and an unsettled political climate.

Since 1995, farmers have been reestablishing regional organizations. Agro-Nascente (1996) counted 75 Japanese-Brazilian agricultural cooperatives and 10 cooperative-derived companies in Brazil by March of 1996. The numbers were still expected to increase. Membership in these organizations varied from 20 to more than 6,500 people. Private Company formation has been preferred in areas of predominantly *nisei* farmers, who point out that there is little merit to cooperative organization under current Brazilian law.

Summary

The first large-scale emigration out of Japan was prompted by Portuguese contact. These Europeans introduced new technologies to Japan, thereby accelerating national reunification and improving navigation. Catholic missionaries then brought new knowledge of the external world, which spurred Japanese curiosity about foreigners and their homelands from the end of the 16th century to the beginning of the 17th century. The Tokugawa Shogunate, however, calculated that growing Japanese Catholicism might lead to an Iberian invasion of Japan. In response, the shogunate enforced a national seclusion of more than two centuries, which slowed Japan's development vis-a-vis the

outside world. The Western Industrial Revolution could not bypass the Far East as a target of trade, and ultimately the US forced open Japanese ports in the mid-19th century. Drastic socioeconomic and political changes occurred subsequently. Rapid Japanese modernization led impoverished people to seek employment in Hawaiian sugarcane plantations by the late 19th century. The Japanese government encouraged '*dekasegi*' movement overseas, for it generated transfers of foreign capital back home. Japanese immigrant workers soon reached to the West Coast of the United States, especially California, as farm laborers. As they grew into independent farmers, they had to face racial prejudice, which led to the US exclusion of Japanese immigration in 1924.

Emigration agents found Brazil open to Asians, and in need of laborers to work on coffee plantations in São Paulo State. Japanese colôno immigration started in 1908. The US policy against Asian immigrants influenced some Brazilian leaders to have similar, exclusionary views. However, the need for Japanese for farm labor and agricultural development was great. After 1925, the Japanese government adopted immigration to Brazil as a national policy, subsidizing passage and actively assisting immigrant farmers to become independent. To attenuate anti-Japanese sentiment

in southern Brazil, the Amazon was chosen as a new site for agricultural settlements. After an interruption from 1942 to 1951 due to World War II, Japanese immigration to the Brazilian Amazon resumed. Immigration slowed after the mid-1960s, due to the rapid post-war economic recovery in Japan, as summarized in Figure 2-1.

Japanese immigrants contributed significantly to Brazil's agricultural development, through crop improvement, commercialization, and the formation of agricultural cooperatives. Japanese settlers in the Amazon created two export products: jute and black pepper. Both of these products assisted in the recovery of the regional economy after the rubber boom went bust (see Chapter 2).

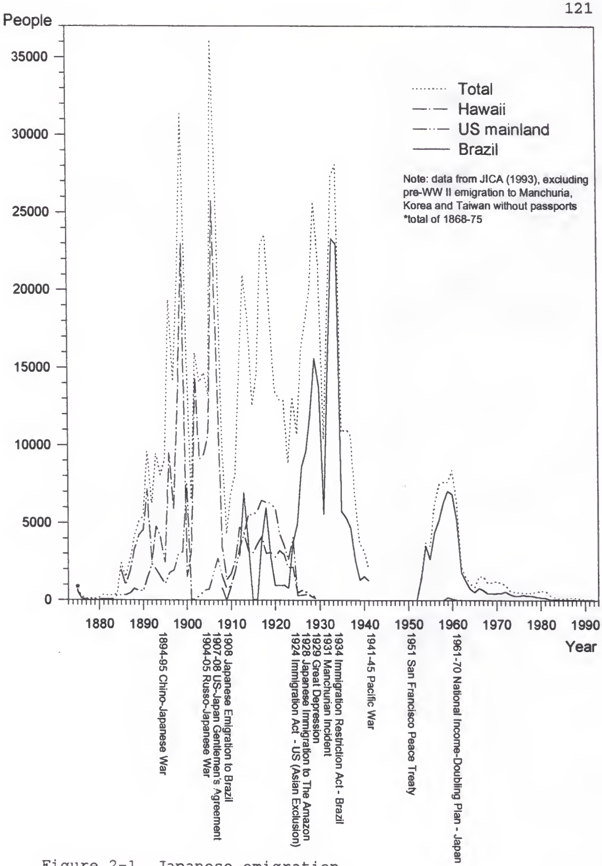


Figure 2-1. Japanese emigration

CHAPTER 3
JAPANESE IMMIGRATION TO THE BRAZILIAN AMAZON

Introduction

This chapter first discusses the course of Japanese immigration to the Amazon. Japanese agricultural settlement projects, based on forest land concession contracts with Pará and Amazonas States, are reviewed. The immigrants' struggle in the corners of tropical rain forest, and their agricultural achievements, are followed. It was their success in jute and black pepper culture that made Brazil admit post-World War II Japanese immigrants. The post-war Japanese settlement history in the Amazon is focused on northeastern Pará, especially Tomé-Açu as a model case. There, crop diversification of Japanese immigrants leading to unique agroforestry systems is summarized.

Advent of the *Conquistadores* and Early Development of the Brazilian Amazon

Spanish troops led by Francisco de Orellana (1511-46?) made the European discovery of the Amazon. Orellana had been an alienated subordinate of Gonzalo Pizarro (1511-48) in Quito. Looking for ***El País de la Canela***, the Land of

Cinnamon, his troops sailed down the Napo River and the length of the Amazon River to its estuary during 1541 to 1542. This group was followed by various Spanish adventurers searching for El Dorado, rumored to be in this region. By the end of the 16th century, the British, Dutch and French entered this race for gold from the northern shores of South America, disembarking in Guiana. The Dutch and French became interested in Maranhão, and decided to vie with the Portuguese there for control of what is today Brazil's Northeast Region (Nordeste). The French founded São Luis, the current capital of Maranhão, in 1612. However, Portuguese, serving under the Spanish crown from 1580 to 1640, drove the French away in 1615. The Portuguese then proceeded further north and established Fort Presépio at Feliz Lusitânia (now Belém do Pará) in 1616. By 1632, they had swept away both British and Dutch citadels from the Amazon basin. A Portuguese fleet, led by Pedro Teixeira (1570-1641), explored the Amazon River from Belém in 1637, sailed up the Napo River and finally reached Quito in 1639. In 1639, the Dutch returned to the Amazon, occupied Maranhão between 1641-42, but ultimately failed in their colonization efforts. After these events, Portuguese dominance of what is now the Brazilian Amazon was acknowledged by other European nations. Pará (today's Belém) was made a regional

capital (***capitania***) for the first time in 1652. São José do Rio Negro (today's Manaus) was likewise designated the capital of today's Amazonas in 1757. Pará, including Amazonas, was finally separated from Maranhão in 1772, and became a province (***província***) in 1817. Amazonas became independent from Pará in 1850. After the commonwealth revolution of 1889, Pará and Amazonas were made states (***estados***) of the new federation. [Noda 1929, Cruz 1973, Latorre 1995]

Agricultural development of the Amazon was initiated when settlers in Belém planted cacao (*Theobroma cacao*) trees, beginning in the late 1670s. This planting was 'authorized' by the king of Portugal. From 1730 to 1745, more than 80 percent (peaking at 96.6 percent in 1736) of the monetary value of Pará's exports was cacao. This included all forest extractives. Pará remained the sole producer of cacao until 1752, when Bahia established its own plantations. By 1888, Pará was exporting 6,907 metric tons (t) annually. This production declined thereafter, due to the introduction of cacao culture to West Africa in 1879, and because of the Amazon's rubber boom, which began in the late 19th century and continued until 1914. [Le Cointe 1934, Alden 1974, CEPLAC 1981]

Cotton was first exported from Pará to Portugal in 1777. Though annual cotton exports increased during the next 100 years, to 7,644 t by 1877, it was interrupted from 1892 to 1914. Sugarcane production peaked in the 1880s, to 1,374 t in 1881, then likewise fell flat after 1899. Rice was cultivated in Pará from 1877 to 99. The breakdown of these early plantations in the Amazon was caused by the emancipation of slaves, followed by the rubber boom and bust. [Fukuhara, et al. 1927, Noda 1929, Cruz 1973]

The affects of rubber collapse is illustrated by the work of Santos (1980, see Table 3-1). In 1920, the monetary value of total production from the Brazilian Amazon reduced to half of its 1890 level, and to almost one-fifth of its level in 1910. The collapse was most significant in the plant extraction industry, where rubber latex was the dominant product. This decline was to less than one-fifth of its 1890 level and one-twelfth of its 1910 level. Secondary (manufacturing and construction) and tertiary (commerce, government, and other services) sectors showed patterns similar to the downward movement of the plant extraction industry. The agriculture and animal products sectors, including cattle ranching, fishing, and hunting, were stagnant during the rubber boom. Cattle slaughter and fish catches finally increased, showing signs of recovery by 1920.

Table 3-1. Total regional economic production by economic sector, Brazilian Amazon, 1890-1920

Sector	1890 Contos*[1]	%	1900 Contos*[1]	%	1910 Contos*[1]	%	1920 Contos*[1]	%
	1,000CZ$[2]*	*index*	*1,000CZ$*[2]*	*index*	*1,000CZ$*[2]*	*index*	*1,000CZ$*[2]*	*index*
Agri-culture	8,143	7.7	20,833	5.6	9,593	2.0	31,251	9.1
	72,970	*100*	*76,311*	*105*	*45,816*	*63*	*42,783*	*59*
Plant Ex-traction	37,914	35.7	141,484	38.1	197,811	40.7	57,182	16.6
	339,747	*100*	*518,256*	*153*	*944,745*	*278*	*78,282*	*23*
Animal Products	7,896	7.4	18,723	5.1	10,883	2.2	35,074	10.1
	70,756	*100*	*68,583*	*97*	*51,977*	*74*	*81,386*	*115*
Manufac-ture	147	0.1	3,054	0.8	15,684	3.2	20,579	5.9
	1,317	*100*	*11,187*	*849*	*74,907*	*5,688*	*28,173*	*2,139*
Con-struction	401	0.4	3,168	0.9	3,921	0.8	3,994	1.2
	3,594	*100*	*11,604*	*323*	*18,727*	*521*	*5,468*	*152*
Whole-sale/retail	36,003	33.9	102,216	27.5	149,606	30.8	134,595	39.0
	322,623	*100*	*374,417*	*116*	*714,518*	*222*	*184,261*	*57*
Govern-ment	7,793	7.3	51,220	13.8	53,270	11.0	28,870	8.3
	69,833	*100*	*187,619*	*269*	*254,418*	*364*	*39,523*	*57*
Other Services	7,925	7.5	30,441	8.2	45,065	9.3	33,985	9.8
	71,016	*100*	*111,505*	*157*	*215,230*	*303*	*46,525*	*66*
Total	106,222	100.0	371,139	100.0	485,833	100.0	345,589	100.0
	951,857	*100*	*1,359,482*	*143*	*2,320,338*	*244*	*473,111*	*50*

Source: Santos 1980. The original table had Mineral Extraction sector in 1920, representing 59 Contos (0.0%) or CR$ 80,000. This amount is still included in the Total of this table.
*[1] Contos de Réis = 1,000,000 Réis: monetary unit of that era.
*[2] Values in Contos converted to 1,000 Cruzeiros in 1972. Index shows the production growth in monetary value, compared to that of 1890 (= 100).

During the 1870s, and especially from 1877 to 1879, there were serious droughts and famines in Brazil's Northeast. Rumors of riches from 'black gold' latex caused mass-migration of northeastern brazilians (***nordestinos***) to the Amazon. Migration estimates vary, but included some 300,000 people between 1850 and 1950 (Moreira 1982, Nishizawa and Koike 1992). State and central governments

encouraged this population shift. However, the overheated rubber boom left many abandoned farms in the Amazon. When local food production collapsed, Pará had to depend heavily on food imports to sustain its booming population. [Ikushima 1959, Wakatsuki 1973]

To remedy this situation, the state government invited European immigrants from France, Italy, Switzerland, Belgium, Spain and Portugal to settle along the old Bragança Railway, which stretched 250 kilometers eastward from Belém. Some Spanish immigrants were also invited to Monte Alegre. From 1875 to 1877, a total of 364 settlers from the listed European countries came to Pará. The ***nordestinos*** were encouraged to farm in these regions alongside the Europeans, the latter supposedly being more proficient in advanced agricultural techniques. However, in spite of costly official efforts to supply immigrant farmers with seedstock, livestock and commodity goods, only 117 settlers remained after two years. Pará State also offered land to about 400 Confederate Americans who settled around Santarém and Óbidos after 1867. They apparently could not coexist with emancipated black people after the Civil War, and crossed the equator hoping to establish plantation agriculture using the slave labor still available in Brazil. However, lacking suitable extension services, most of these immigrants ended

up adopting conventional shifting cultivation. [Ikushima 1959, Wakatsuki 1973, Guilhon 1983, Han-Amazônia Nippaku Kyōkai 1994, Governo do Estado do Pará 1995]

Modern infrastructural development of the Brazilian Amazon really began in the late 19th century, as a result of its 'internationalization.' After the region was opened for trading in 1865, the British made strategic investments there, in order to control important sectors of the local economy and society. The Amazon River Navigation Company was founded in London in 1872. A regional telephone company was established in 1895, and a gas company in Belém in 1898. Between 1902 and 1909, a train & electric light company, and a construction company appeared in Belém. A river port company, a city planning company, and a train & electric light company also appeared in Manaus. US capital investment entered the area a little later, founding a river port company in Belém in 1906, and the Madeira-Mamoré Railroad Company in 1907. By the 1920s, regular steamship service between the Brazilian Amazon and Europe/US, and international telegraph services were controlled by British companies. All subsequent business ventures entering the Amazon were destined to depend upon and yield profits to foreign corporations that took early control over the area's local economy infrastructure. [Noda 1929]

Initial Japanese Immigration into the Amazon: The River Descenders

During the Amazon's rubber boom (late 19th century-1914), Pará's governor, Lauro Sodré (terms 1891-97 and 1917-21) encouraged Japanese immigration to promote the state's agricultural development. A speech he delivered on August 21, 1895 stated that a contract had been signed between the Pará State Land Bureau and Júlio Benevides of the Oriental Immigration & Trade Company (***Companhia de Imigração e Comércio Oriental***), Rio de Janeiro, to bring 3,000 Japanese immigrants into the state. This agreement transpired before Brazil and Japan had established diplomatic relations, so there is no official record of this local company having contact with Japanese officials. This contract was probably confined to paper only, for it was never realized. [Ikushima 1959, São Paulo Jinmon Kagaku Kenkyūjo 1996]

On the Japanese side, the Oriental Emigration Company (*Tōyō Imin Gaisha*) submitted a plan to the Japanese government to send immigrants to Pará in 1899. This plan was rejected, however, because the Japanese Ministry of Foreign Affairs had received negative descriptions of the Amazon from early Japanese ministers in Brazil. Therefore, the first Japanese immigrants were sent instead to Peru in

1899. [Ikushima 1959, São Paulo Jinmon Kagaku Kenkyūjo 1996]

Of the 790 immigrants arriving in Peru in 1899, 124 died within 20 months due to locally-contracted diseases. This was caused by overwork, malnutrition, severe climate, and a lack of medical treatment. As for sugercane plantation workers, cajoled into emigrating by Japanese brokers, their condition was no better than that of slavery. Some immigrants wrote a letter to the governor of their home prefecture, pleading to be evacuated. Ryōji Noda (1875-1968), secretary of the Japanese Legation in Mexico and responsible for Peruvian affairs, was dispatched to Peru on a fact-finding mission. He reported to the home government that all surviving Japanese immigrants ought to be repatriated. Nevertheless, more people emigrated from Japan in 1903. This immigration would continue, expatriating 33,070 Japanese, until 1941 when the Pacific War terminated it. [Shimabukuro 1977, Kita 1982, Kokusai Kyōryoku Jigyōdan 1993]

Those immigrants who escaped from contract labor on farms (***haciendas***), travelled across the deserts to Mollendo. There they took a train to Arequipa, and crossed the Andes on foot or horse to the Lake Titicaca valley. From there they climbed the Eastern Cordillera through Aricoma Pass

(4,815 m), and descended into the Tambopata River basin. They became rubber tappers (***seringueiros***) in the forests of the Tambopata basin. Ryōji Noda visited these forest pioneers for one and a half months in 1905, and reported to the Japanese government that he endorsed sending additional Japanese immigrants to do rubber tapping. In 1907, about 100 emigrants were sent by the Meiji Colonization Company (*Meiji Shokumin Gaisha*) to Tambopata. These people later moved to Puerto Maldonado, bringing their 'sacks of British gold coins' that they had earned from rubber tapping in the forest. Some opened small businesses, while others became manufacturers or farmers. Rubber trading companies welcomed Japanese as skillful vessel skippers. More recent Japanese immigrants from Lima joined these pioneers, together forming a community of several hundred people. The more adventurous among them pushed further into the Bolivian Amazon, settling around Cobija, Riberalta, and Trinidad. As early as 1905 (or 1907, according to the São Paulo Jinmon Kagaku Kenkyūjo 1996), some crossed the Brazilian border. When the rubber boom started to decline, Japanese tappers engaged in various kinds of work, including precious wood extraction, tobacco plantation work, and suburban vegetable farming. [Izumi and Saitō 1954, Ikushima 1959, Shimabukuro 1977, São Paulo Jinmon Kagaku Kenkyūjo 1996]

A fair number of Japanese joined the 365 km Madeira-Mamoré Railroad construction effort between Porto Velho and Guajará-Mirim from 1905 to 1912. A successful Okinawan immigrant from Peru, Norisada Yagi (1885-1976), was awarded a joint contract to construct 45 km of the railroad, employing 30 Japanese and 30 Bolivian workers (Shimabukuro 1977). Medical records of a number of dead Japanese workers were found at the railway company's hospital (Han-Amazônia Nippaku Kyokai 1984, São Paulo Jinmon Kagaku Kenkyojo 1996).

These get-rich-quick dreamers and wanderers, mostly single men, pushed further down the rivers where they intermarried with local women, and eventually grew old enough to despair of returning home to Japan with honors. Their forest journeys often lasted more than ten years by the time they chose to settle down and end their adventures. By the late 1910s, 400 to 500 so-called Japanese 'Amazon River Descenders' (*Amazon-Kudari*) entered Brazil from Peru through Bolivia. The majority of these became scattered deep in the forest, separated from their compatriots. Those who entered Brazil from Cobija descended the Rio Acre to Xapuri or Rio Branco, to become vegetable farmers or general store owners. Still others traveled along the Rio Madeira or Rio Purus to Manaus, and found work in vegetable farming, carpentering, or retailing. It was 1916 when the first

Japanese immigrant settled in Belém, arriving from Peru. This man, named Shōsuke Takahashi (?-1937), worked for a confection business at Travessa Castelo Branco. Subsequently, Seihachi Kawamoto (1886-1939) and his wife, Ito Kawamoto (1896-1991), joined him, after making a seven year, cross-continent journey from Peru. In 1920, the Kawamotos bought a small parcel at what is today Bairro Una, Belém. They became the pioneers of suburban horticulture in Pará. They helped all Japanese who arrived from Peru after they did, as well as other early Japanese settlers in Belém. This included a 7th-dan judo (*jūdō*) master Mitsuyo Maeda (alias Conde Koma, 1878-1941). Maeda was dispatched by Kōdōkan to the United States in 1904, and traveled through Europe and Central/South American countries demonstrating judo. He finally settled in Belém in 1922, where he became popular as a judo master and massage therapist. Through his interaction with the influential figures in Pará, he wound up playing a crucial role in the introduction of Japanese agricultural projects to the Amazon. Some Japanese drifters from Peru were later hired by the Japanese Plantation Company of Brazil (***Companhia Nipônica de Plantação do Brazil S.A.*** = *Nantaku* [*Nanbei Takushoku Kabushiki Gaisha*]) at Belém and Tomé-Açu, while others moved still farther south to São Paulo, seeking what would be their eventual success. [Izumi

and Saitō 1954, Ikushima 1959, Mishō 1976, Han Amazônia Nippaku Kyōkai 1984, Han Amazônia Nippaku Kyōkai 1994, São Paulo Jinmon Kagaku Kenkyūjo 1996]

Meanwhile, news of the rubber boom reached those Japanese coffee plantation workers in São Paulo State who had been shipped by the Imperial Colonization Company (*Kōkoku Shokumin Gaisha*) on the *Kasato-maru* in 1908. The bad crop of coffee that year raised unrest and escapes of immigrants at contracted plantations, which entrapped the immigration company in financial difficulty. The company's Japanese agents in São Paulo kept themselves from starving by hand-making and hawking traditional Japanese toys. In 1909, Masahiko Matsushita (1870-194x) hawked such toys in Manaus during the rubber boom. He was accompanying another man and four families who had escaped their contracted coffee farms in São Paulo. They all hoped to make money by rubber tapping, but gave up this plan when they understood the long distance from Manaus to rubber-rich forests. In 1911, Teijirō Suzuki (1879-1970), the pioneer immigrant before *Kasato-maru* (see Chapter 2), made a plan to introduce Japanese immigrants to the Amazon as ***seringueiros***. However, this was prohibited by the Japanese minister in Brazil. In 1912, Suzuki traveled alone to the Amazon after which he wrote two articles to *Ōsaka Asahi Shinbun* newspaper, arguing

that the agricultural development of the Amazon was a 'mission of the Japanese people.' [Ikushima 1959, Kita 1982]

Post-Rubber Boom Land Concessions and the Japanese Response

Rubber tree (*Hevea brasiliensis*) seeds were smuggled to England's Kew Gardens in 1876 by Sir Henry Alexander Wickham (Dean 1987). Rubber tree was then successfully transplanted on British colonial plantations in Ceylon (now Sri Lanka) and Malaysia. This alternative source of rubber eventually outcompeted natural rubber latex extraction from the Amazonian rainforest. In 1910, Brazil had generated 50 percent of global crude rubber production. Brazil's rubber accounted for only 5 percent of global production by 1926 (Nishizawa and Koike 1992). The Brazilian Amazon's economy entered a great depression, losing both its rubber market and the plantation agriculture that had existed before the rubber boom. Old plantations became covered by secondary forests, while local farmers took up subsistence agriculture, small scale tobacco cultivation, and wood and latex extraction from the forest (Fukuhara et al. 1927).

The Pará and Amazonas state governments tried desperately to attract investment, both foreign and domestic. They granted large state land concessions, which

were considered valueless without development. In August 1923, the US government conducted a ten month survey of rubber in the Brazilian and Peruvian Amazon. The US was then consuming 80 percent of global crude rubber production for car tires, a component of its growing automobile industry. However, latex rubber production had become monopolized by the United Kingdom with its plantations in South and Southeast Asia. Inspired by a 1924 US research report, Henry Ford (1863-1947) sent an expedition to the Amazon. The Ford Company took control of a 500,000 hectare concession belonging to a Brazilian, Jorge Dumont Vilares. It also acquired 1,000,000 hectares of its own, next to the Vilares concession, from Pará State. The land was located on the east bank of Tapajós River, and stretched from what is today Santarém to Itaituba. An official contract was signed between Pará's governor, Dionysio Ausier Bentes (term 1925-29), and a Ford representative on July 21, 1927. The development project started in late 1928, with the goal of creating extensive rubber plantations. [Noda 1929, Ikushima 1959]

In 1923, Pará State requested through the Japanese Embassy in Rio de Janeiro that Japanese immigrants be sent to foster agricultural development. This was the year that the Fidélis Reis Bill was submitted to the Brazilian

national congress. This bill's intent was to prohibit black immigration, and restrict yellow immigration to an annual maximum of just 5 percent of the number of yellow immigrants in Brazil at that time. This proposal was allegedly triggered by a rumor that the US was planning to send 200,000 blacks to the Amazon. However, the focus of this bill gradually shifted to the yellows, i.e. Japanese immigrants, then becoming conspicuous in São Paulo. It was caused by the influence of US domestic politics (see Chapter 2). [Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai 1991, Comissão de Elaboração da História dos 80 Anos da Imigração Japonesa no Brasil 1992, Nishizawa and Koike 1992]

The first Japanese Envoy Extraordinary and Ambassador Plenipotentiary to Brazil, Shichita Tatsuke (1867-1931, term 1923-26), and his embassy staff busily occupied themselves with calming down this anti-Japanese campaign. Anti-Japanese sentiment was a potential threat to Japan, due to the effects of the 1923 Tōkyō Earthquake (*Kantō Daishinsai*). Rural Japanese villagers were impoverished, while cities were overflowing with the unemployed. A safety valve was desirable, such as sending some of these Japanese overseas. The Japanese Embassy in Brazil concluded that immigrants should be dispersed to regions other than São Paulo and its neighboring states. They remembered the lessons in

California and on the West Coast of the US (see Chapter 2). However, most Japanese in Brazil, especially influential ones in São Paulo, had negative opinions about northern Brazil. Ambassador Tatsuke dispatched his secretary, Ryōji Noda (1875-1968) to investigate the Amazon in 1924. Noda visited Pará's governor, Antônio Emiliano de Sousa Castro (term 1921-25), and traveled upriver to Iquitos, Peru. That same year the new Immigration Act of the US, which excluded Asian immigration, passed the House and the Senate, and became law on July 1, 1924. In Brazil, an anti-Japanese front led by Dr. Miguel de Oliveira Couto (1864-1934), president of Brazilian Academy of Medicine (***Academia Nacional de Medicina***; term 1914-34), loudly advocated exclusion of Japanese from both eugenic and economic viewpoints. [Ikushima 1959, Nishizawa and Koike 1992]

In 1925, the Japanese Ministry of Foreign Affairs sent Yasuhei Ashizawa to do an agricultural survey in Brazil, focusing on cotton production. He visited São Paulo and some northern states for several months, accompanied by Hideo Nakano (1894-1936), an employee of the Kanegafuchi Spinning Corporation (*Kanebō* [*Kanegafuchi Bōseki Kabushiki Gaisha*]) who had been studying in Brazil since 1923. They visited Governor Dionysio A. Bentes in Pará, presenting him with a letter of introduction from the Japanese ambassador.

Governor Bentes accompanied them to state-owned lands along the Bragança Railway, and suggested they also inspect another state property in the Capim River Basin. Mitsuyo Maeda (alias Conde Koma; 1878-1941) contributed to this research as a guide and mediator. He also introduced Ashizawa to the landlord Samuel Fonseca who wanted Japanese immigrants to help develop his estate along the Moju River (or Amapá according to Fujii 1955). Hearing of Ashizawa's conclusions after his survey, Governor Bentes wrote a letter dated May 28, 1925, to Japanese ambassador Tatsuke. It provided for a one year reservation of right to demarcate 500,000 ha within Pará's property in the Capim River Basin, for the purpose of settling 20,000 Japanese farming families. Ambassador Tatsuke discussed this offer with his secretary, Ryōji Noda, who drafted an official report of the offer to the Japanese Foreign Minister, Kijūro Shidehara (1872-1951; term 1924-27 and 1929-31, prime minister 1945-46). The Japanese embassy requested the home government dispatch a scientific survey team, and find an appropriate corporation or cooperative that could establish an enterprise based on the land granted by Pará State. In the remote tropical forest, unlike in São Paulo, little ***colono*** employment was available for the poor immigrant farmers to earn initial capital for independence. Therefore,

commitment of sufficiently large capital support was anticipated for an integrated rural development. [Fujii 1955, Ikushima 1959]

Foreign Minister Shidehara was sensitive to immigration issues, as he had witnessed the Asian exclusion process in the US while ambassador there (term 1919-24). However, the Japanese government was short on resources after the 1923 Tōkyō Earthquake and the subsequent economic crisis (Ikeda 1965). Sanji Mutō (1867-1934), president of the *Kanebō* Corporation (1921-30, counselor 1930-34), was asked to cooperate on this project. Mutō had studied at *Keiō Gijuku* (now Keiō University) under Yukichi Fukuzawa (1835-1901), an educator and advocate of using Western knowledge to modernize Japan (his portrait is on the ¥ 10,000 banknote). After graduating in 1884, Mutō went to California as a working student. He left Japan on January 27, 1885, aboard the City of Tokyo, which was transporting the first official contract immigrants to Hawaii. While in the US, Mutō paid keen attention to Chinese immigrants. Returning home in 1887, he published a pioneering essay encouraging permanent Japanese emigration to the US ('*Beikoku Ijū Ron*'). Mutō rejected the 'birds-of-passage' approach to emigration, and discussed the need for appropriate emigration policies and agents for Japanese farmers who wished to cultivate the vast

vacant lands in the US. In 1923, Mutō founded the Businessmen's Association (*Jitsugyō Dōshikai*) political party, and was elected to the House of Representatives from 1924 to 1932. Regarding Brazil, he sent three *Kanebō* employees there as students in 1923, to lay the groundwork for future business in cotton fiber. The dispatch of Ashizawa to Brazil by the Japanese Ministry of Foreign Affairs in 1925 to do a cotton survey was also proposed by Mutō. A general meeting of *Kanebō* stockholders approved the company's contribution of ¥ 80,000 (US$ 37,500) to the government mission. Hachirō Fukuhara (1874-1943), one of *Kanebō*'s directors, was appointed leader of the mission. Other members included a professor of medicine from the University of Tōkyō (Dr. Kikutarō Ishihara), a quarantine official from the Ministry of the Interior (Yasuzō Iimura), three surveyors from the Ministry of the Interior (Hachirō Taniguchi, Yoshimasa Tamura, and Shōei Mizumura), a forester (Seiitsu Ishihara), an agronomist (Yasuhei Ashizawa), and a *Kanebō* student (Shōnosuke Ōta) to be the mission leader's secretary. [Fujii 1955, Tsutsui 1957, Ikushima 1959, Mishō 1976]

The Fukuhara Mission left Japan from Yokohama on March 20, 1926 (Fukuhara et al. 1927). They arrived in New York on April 11, and stayed there for a month to survey

documents about the Amazon concerning its soil, climate, rivers, forests, animals, plants, minerals, tropical diseases, etc. There they met Dr. Hideyo Noguchi (1876-1928), who was well-known for having isolated the syphilis spirochete. Noguchi was then engaged in yellow fever studies at the Rockefeller Institute for Medical Research. His knowledge of tropical diseases was sought. The mission was welcomed by members of the South America Association (*Nanbei Kyōkai*) in New York. Discouraged by ethnic oppression in the US, some twenty to thirty Japanese businessmen were planning future business enterprises in South America, under the leadership of Yasumoto Murai, of the Morimura Company. At a reception, they officially launched the South America Syndicate (*Nanbei Kigyō Kumiai*) and entrusted funds to Fukuhara, who personally joined the Syndicate, to purchase farmland in the Amazon. [Ikushima 1959, Misho 1976]

The Japanese ambassador to Brazil, Shichita Tatsuke, left Rio de Janeiro on April 17, 1926, to introduce the Fukuhara Mission to Governor Dionysio A. Bentes in Belém. Hearing of this, the governor of Amazonas, Ephigênio de Salles (1879-1939; term 1925-29) invited the Japanese ambassador over to Manaus. While waiting for the delayed mission, the ambassador visited Amazonas from May 5 to May

10, 1926. During a festive reception, the governor asked the ambassador to send the Fukuhara Mission on to visit Manaus. He emphasized that Amazonas would provide any amount of land, having conditions as good as those in Pará. On this occasion, the ambassador's entourage included Kinroku Awazu (1893-1979), who acquired a 1,000,000 hectare concession in 1927 (Ikushima 1959). The Fukuhara Mission finally arrived in Belém, Pará, on May 20, 1926 (Fukuhara et al. 1927). After meetings with Pará State officials, the ambassador returned to Rio de Janeiro on June 17, and left Brazil for Japan on July 31, 1926. [Ikushima 1959]

Ambassador Tatsuke recognized the immediate need for further study of the six northern states of Brazil, namely: Pará, Amazonas, Maranhão, Ceará, Rio Grande do Norte, and Bahia. He urged the home government to send two more groups of researchers, consisting of at least three specialists each, for a one year study in those six states. His official report was also submitted, in which he concluded:

> "... Unlimited natural resources are still underdeveloped in the Brazilian northern states where population and capital are scarce. Although state governments have been calling for immigrants, Europeans rarely come to settle because of the climate. Japanese are welcomed as their substitutes. Most of the local residents are mestizos having similar face, body and color to Asians. This may account for their amiable attitudes toward Japanese, which will greatly facilitate the assimilation of our immigrants in the future. Spreading our compatriots to the north will satisfy both local officials concerned with development, and the Brazilian public opinion that does

> not prefer concentration of foreign nationals in a region (e.g., Japanese in São Paulo). Due to less competition, Japanese may have better hope for success in the north. While there is little opportunity of wage employment, cheap land may help in creating independent farmers. The state governments grant free land titles for small farmers. However, it is a remote alien land where language, custom and climate are different. Hence, the Japanese government should establish an institution to guide our immigrants, by conducting research on the geography and economy of the region, on negotiations with landlords, local authorities and residents, and on agricultural production, marketing and finance..."

Shichita Tatsuke committed his life to the promotion of Japanese immigration to the Amazon. His poem (*waka;* consisting of 5-7-5-7-7 syllables) of August 1928 reads: "*Chihayaburu Kamiyo-nagarano Amazono-ni Utsushi-uenamu Yamato-tamikusa*" (Let us transplant Japanese grassroots in the heavenly garden of ancient gods) (Ikushima 1959). Later his son, Keiichi Tatsuke (1907-94) also became ambassador to Brazil (term 1961-67), and then chaired (term 1975-82; president 1982-94) the Japanese-Brazilian Central Association (*Shadan Hōjin Nihon Brazil Chūō Kyōkai* = ***Associação Central Nipo-Brasileira***), founded in Tōkyō in 1932. This is an extra-departmental body of the Ministry of Foreign Affairs. He was also keenly interested in the Amazon, remaining loyal to his father's will. [Ikushima 1959, São Paulo Jinmon Kagaku Kenkyūjo 1996, Shadan Hōjin Nihon Brazil Chūō Kyōkai 1983]

Four other people joined the Fukuhara mission in Belém: the Japanese Embassy's agricultural engineer, Nobutane Egoshi (1885-1955); the judoist, Mitsuyo Maeda (1878-1941); the *Kanebō* student, Hideo Nakano (1894-1936); and Kosaku Ōishi (1889-1973). Ōishi worked for the *Kanebō* Corporation beginning in 1910, and resigned as a chief engineer in 1923. He then went to Europe to survey industries there. He was still traveling in Brazil when the Fukuhara Mission arrived. He joined the group as an interpreter. [Ikushima 1959, Mishō 1976]

The mission first visited the Capim River Basin. After three weeks there, mission members concluded that it was not a suitable area for Japanese settlement. On July 4, 1926, Fukuhara, Maeda, and Egoshi reported to Governor Bentes that: 1) The land was undulated and lacked extensive plains; 2) There were wetlands everywhere, harboring malarial diseases; 3) The river's course was irregular, with many fords that would obstruct transportation; and 4) There was little fertile soil for agriculture. The governor advised them to survey whatever other state-owned lands they wished. Fukuhara divided his team into two parties, sending one to the Moju River Basin, and the other to the Acará River Basin. The latter was found preferable, because: 1) the soil was fertile; 2) the river system was ideal for

transportation; 3) the land was relatively elevated and well drained (***terra firme***); and consequently 4) the area was salubrious, without wetland-associated diseases. Fukuhara and Governor Bentes agreed upon a land concession that included: 1) 500,000 ha between the Acará River and its tributary, the Acará Pequeno River (today's Acará-Mirim River); 2) 50,000 ha to be delineated between the Acará River and the Moju River; 3) 50,000 ha to be delineated between the Moju River and the Tocantins River; 4) 25,000 ha to be delineated along the Bragança Railway. The governor wrote an official letter dated August 14, 1926, to the Japanese Foreign Minister Kijūro Shidehara, listing the negotiation's progress. He set the condition that an official contract between Pará State and the Japanese concessionaire should be signed by December 31, 1927. Fukuhara noted in his report to the Japanese government that Pará's governor implied a future possibility of adding more land, if the Japanese successfully developed the land concession granted in Acará. [Fukuhara et al. 1927, Ikushima 1959]

The Fukuhara mission also visited the Guamá River Basin in Pará, in particular the land concession of João Augusto Cavaleiro. The owner himself had requested this visit. Cavaleiro had been granted the land from Pará State in 1924,

with the intent of either settling Japanese immigrants on it, or selling it subsequently to the *Kanebō* Corporation. The concession covered 100,000 ha, stretching over what is today Ourém, Santa Luzia do Pará, Bragança and Viseu. However, it was a lowland area, inappropriate for cotton planting, lacking access to river transportation, and frequented by the 'savage' Urubu Indians. The Japanese mission lost interest in Cavaleiro's land, because of the sizable alternative in Acará. Fukuhara included in his official report as an annex, the details of the Cavaleiro Concession and plans for its development (Fukuhara et al. 1927). During his busy schedule, Fukuhara was still able to search for land for the South America Syndicate (*Nanbei Kigyō Kumiai*) in New York, and thus purchased the Lombardia Farm (2,770 ha) in Castanhal, Pará. This was an Italian-owned sugarcane (*Saccharum officinarum*) plantation with a sugarcane spirit (***cachaça***) factory and a sidetrack connected to the Bragança Railway. Fukuhara posted Hideo Nakano as the farm's caretaker, until a manager arrived from New York. The Fukuhara mission then turned to Nordeste Region, making stopovers in Maranhão, Piauí, Ceará, and Rio Grande do Norte. Mission members surveyed local cotton production and its potential. They also met with all the state governors to investigate the possibility of future Japanese

immigration. After visiting São Paulo and Paraná, they left Rio de Janeiro on December 8, 1926 to return to Japan. Since Fukuhara could not make a visit to Amazonas, he urged the home government to send another mission there to satisfy Governor Salles. The governor was eager to invite Japanese immigrants there, and changed the state law so that a 1,000,000 hectare concession could be assigned legitimately. However, due to transportation and access problems, Fukuhara recommended in his report to limit the scope of any future immigration to the banks of the Amazon River, between Santarém and Manaus. [Fukuhara et al. 1927, Mishō 1976]

After Fukuhara left for Japan, Akira Ariyoshi (1876-1937) arrived from Switzerland to assume his post as the second Japanese Envoy Extraordinary and Ambassador Plenipotentiary to Brazil (term 1927-30) on January 25, 1927. This was the same date that Genzaburō Yamanishi, a young Japanese businessman, left Rio de Janeiro for a trip to Manaus, accompanied by Kinroku Awazu. Without advising the Japanese government, these two men obtained a 1,000,000 hectare concession from Amazonas' governor, Ephigênio de Salles, on March 11, 1927 (the Yamanishi-Awazu Concession). Ambassador Ariyoshi advised the surprised home government to maintain a positive attitude towards future Japanese private enterprise in the Amazon, which could potentially be of great national interest. In July, 1927, Chūichi Ōhashi

(1892-1975), a secretary of the Japanese Ministry of Foreign Affairs, reported his presence to the Japanese Embassy in Rio de Janeiro. Ōhashi had been a Japanese consul in Los Angeles, California up until April of that year. He was stopping over in South American countries to observe the situation of Japanese immigrants, while on his way home. He visited Brazil for about four months, during which he traveled to Pará and Amazonas, guided by Mitsuyo Maeda and Hideo Nakano. Ōhashi was pleased with cheap land prices and no racial prejudice regarding land purchases, unlike in California. He therefore made himself the 'first Japanese landlord in the Amazon,' purchasing lots at Curralinho (270 ha) of Marajó Island, and at Castanhal (50 ha) along the Bragança Railway in Pará. He felt that Japan should promote such enterprises in the Amazon, to satisfy those Brazilian authorities who looked to Fukuhara and others as conduits of immigration. If Japanese concessionaires should fail to realize their development projects, disappointment among the Brazilians there could result in anti-Japanese sentiment. This would make future Japanese businesses in the region difficult. Ambassador Ariyoshi telegraphed these opinions to the home government and called for its special attention. After Ōhashi returned to Japan, he served as chief of the Emigration Division of the Ministry of Foreign Affairs beginning in August 1929. In this capacity, he officially

supported the start of immigration projects in the Amazon. When Ōhashi became the Permanent Vice-Minister of the Ministry of Foreign Affairs, in 1940, he invited Mitsuyo Maeda to return home for a visit, to reward his many contributions. This visit did not transpire, however, due to the outbreak of World War II. [Ikushima 1959, Chiba 1977]

In September of 1927 the Fukuhara Report was published by the Japanese Ministry of Foreign Affairs and was distributed to many influential people. In that same year, the Businessmen's Association (*Jitsugyō Dōshikai*) party, headed by Sanji Mutō of *Kanebō* Corporation, joined the cabinet of Prime Minister Giichi Tanaka (1864-1929; term 1927-29, with concurrent service as Minister of Foreign Affairs) of the Friends of the Constitutional Government Party (*Rikken Seiyūkai*). On March 26, 1928 Prime Minister Tanaka called a meeting of some 60 businessmen to discuss the content of the Fukuhara Report at the foreign minister's official residence. The renowned elder, Eiichi Shibusawa (1840-1931; founder of Daiichi Kangyō Bank and Ōji Paper Company) led a discussion which resulted in the formation of a twelve person steering committee. After two further meetings, this commiittee entrusted the establishment of a new enterprise to the *Kanebō* Corporation. Twenty promoters

of this enterprise were designated, including *Kanebō* directors Sanji Mutō, Hachirō Fukuhara, and Satoru Hiraga (1860-1931). Hiraga would later designate his son as an immigrant leader in the Amazon. Yasumoto Murai, of the South America Syndicate (*Nanbei Kigyō Kumiai*) in New York, also promoted the enterprise. Japanese capitalists responded positively to this government-sponsored project, since the domestic Japanese economy was stagnating, offering little chance for profitable investment. The articles of the South America Development and Colonization Corporation, or *Nanbei Takushoku Kabushiki Gaisha* (*Nantaku*), were completed on April 19, 1928. The company was founded on August 11, 1928, having initial capital resources of ¥ 10,000,000 (US$ 4,651,163). Hachirō Fukuhara was the corporation's first president, while Saburō Chiba (1894-1979; elected to House of Representatives 1925-30 and 1949-76; president of Tokyo University of Agriculture 1955-59) was appointed director. Chiba had been a schoolmate of Chūichi Ōhashi at the University of Tokyo. He studied at Princeton University and then became an aide to Sanji Mutō, until the latter's death. [Ikushima 1959, Mishō 1976, Chiba 1977, Nishizawa and Koike 1992]

Therefore, Japanese immigration to the Amazon entered a new epoch beginning in the late 1920s. The Pará and

Amazonas States having development needs, the Japanese government executing National Policy Immigration (see Chapter 2), and the *zaibatsu* capitalists interested in land investment envisioned their common goal deep in the tropical rain forest.

Japanese Agricultural Development Projects in the Amazon before World War II

Amazon Enterprise Corporation and Overseas Colonization School - Maués, Amazonas

Kosaku Ōishi

Kosaku Ōishi (1889-1973), who left the Fukuhara Mission after its expedition to Pará, traveled alone up the Amazon River to Maués, Amazonas. He had the intention of cultivating the local speciality guaraná (*Paullinia cupana*), a tonic of the Maué tribe, and marketing it globally. Having gained the informal consent of the governor, Ephigênio de Salles, for a concession of land, Ōishi returned to Japan in 1927 to campaign for the establishment of a company. On September 6, 1928, the Amazon Enterprise Corporation (*Amazon Kōgyō Kabushiki Gaisha*) was founded, having initial capital resources of ¥ 250,000 (US$ 116,279). Ōishi was named one of the company's three directors. Stockholders who bought more than 20 stocks (¥ 500 = US$ 233) were deeded 15 ha for settlement within the concession.

Ōishi had already left Kōbe, Japan for Brazil on May 17, 1928, accompanying a construction party. With permission from the Amazonas state government, Ōishi began opening the first plot of 105 ha on September 6, 1928. The site was on the east shore of Maués-Açu River, three kilometers upstream of Maués Town (***Cidade Maués***). This was the first effort made by Japanese enterpreneurs to manage the Amazonian forest. On the site there gradually emerged a company office, a medical post, a warehouse, temporary quarters for immigrants, a cassava mill, and other structures. Next to the headquarters was a company-owned farm.

Ōishi finalized the land concession deal with the State of Amazonas on October 20, 1928. The concession comprised 25,000 ha on the east shore of the Rio Maués-Açu. It was located 6.6 kilometers (km) upstream from Maués Town, or 3 km upstream from project headquarters, which had been named 'Salleshi' (short for Salles City in Japanese) in honor of Governor Salles. The construction party completed planting of 45,000 guaraná saplings on the company-owned farm by November of 1928. The stands of trees were intercropped with upland rice (*Oryza sativa*). In February of 1929 the project's managing director, Takeo Sawayanagi, came to Maués to inspect the project along with some visitors from Japan. Sawayanagi also brought with him Buichi Yamane (1890-1985),

an Amazon-Descender (*Amazon Kudari*) horticulturist from Manaus, as an agricultural consultant; and Masayuki Kashimura, an employee of the Belém subsidiary of South America Development and Colonization Corporation, the Japanese Plantation Company of Brazil (***Companhia Nipônica de Plantação do Brasil S.A.***), to provide medical care.

The first group of 50 immigrants, which included 7 families and 19 single young men, arrived on January 5, 1930. These immigrants were unable to fell trees and open farmland during that first rainy season. For short-term subsistence they intercropped rice in the company's existing guaraná plantation, while planting cassava (*Manihot esculenta*) in forest clearings adjacent to the plantation. At this critical time, Ōishi suddenly resigned his directorship and withdrew to his private concession across the Maués-Açu River. He found the meager funds transferred from Tōkyō to be intolerably small. Meanwhile, immigrants complained about being short of money, having already invested heavily in company stock.

In July of 1930, Sawayanagi took a second group of immigrants, 66 persons including 12 families and 22 single young men, to Maués. A negotiation was finalized in October of 1930 that changed this concessionship from Ōishi to Sawayanagi. However, this project declined quickly due to

poor leadership and insufficient capital. Local merchants had also won a monopoly of guaraná production from the state government, which inhibited the growth of Japanese guaraná producers. By 1931, the last 11 immigrants arrived at the Maués site in two groups, ending this immigration with a total of 195 individuals: 11 construction party members, 136 people from 29 families, and 48 single young men. [Noda 1929, Ikushima 1959, Mishō 1976, Han-Amazônia Nippaku Kyōkai 1994]

Hisae Sakiyama

Hisae Sakiyama (1875-1941) envisioned the establishment of an immigrant school in Maués. Sakiyama was born in a small farming family in Kōchi prefecture, and then immigrated to a Christian settlement in Hokkaidō in 1893, where he was baptized. Hoping to be an evangelist, he entered the mission-founded Tōhoku Gakuin Secondary School in Sendai as a working student in 1897. He then proceeded to what is today's Aoyama Gakuin University in Tōkyō. In 1902, he founded the Aoyama Working Students Association (*Aoyama Gakusei Rōdōkai*) with his friends. After quitting school in 1906, he started a suburban dairy where students could support themselves by making milk deliveries. During that period, jobs were scarce for university graduates who had no family connection. Sakiyama became concerned about

his students, and set off to investigate conditions in the New World, where many of his schoolmates had immigrated. From February 1914 until February 1916, he traveled through the US, Mexico, Panama, Peru, Chile, Argentina, and Brazil. He observed that the majority of Japanese immigrants in the Americas were 'birds of passage,' and did not enjoy harmonious living conditions. Most were not well accepted by their host societies, as they had not received proper orientation from the Japanese government about communication and assimilation. Calling them '*Kimin*' (people deserted by their home country), Sakiyama used their plight as helpless and alienated compatriots to canvass for donations to establish a school for them. This school was to educate the future leaders of Japanese immigrants in the Americas. Sakiyama gained support for his cause from influential people like: Eiichi Shibusawa, Osachi Hamaguchi (1870-1931, prime minister 1929-31, home minister 1926, finance minister 1924-25), and many others.

In due course the Overseas Colonization School (*Kaigai Shokumin Gakkō*) was opened in Tōkyō in 1916 (closed in 1942). The school offered a three-year course for primary school graduates over 16 years of age, and a one-year course for secondary school graduates over 18 years old. Courses included: moral study, Spanish, English, agriculture

(including farm practices), commerce (including produce sales), economics, bookkeeping, colonization policy, colonization history, area studies, mathematics (abacus), international law, debate, music, and physical education (Jūdō and Kendō). This was a licensed coeducational school, unique in the time before World War II. It also used the Bible for moral studies instead of oriental textbooks. Women's education was recognized as key to successful immigration, and a female student dormitory was donated by Yasumoto Murai around 1930. The school also emphasized the importance of diligence (labor) and self-expression (elocution). Sakiyama rejected the single male 'birds of passage' immigration approach, citing it as a cause of misunderstanding and anti-Japanese sentiment within host societies. He trained immigrants to be civil diplomats, who should positively represent their motherland through successful assimilation and cultural contributions to their host societies. They could then hope to successfully integrate their children into the social fabric of their new motherlands.

Sakiyama made his second trip to the Americas from November 1927 to March 1929, with the purpose of visiting graduates of the Overseas Colonization School. Ikushima (1959) states that about 300 School graduates and their 1,000 family members had immigrated to South America by

1929. Sakiyama also wanted to cross the Andes from Peru to the Amazon, the land he had yearned to visit for a long time. In June 1928, he visited Maués and was fascinated by the surrounding environment. His *waka* poem reads "*Nanbei-no Chichi-to Haha-to-ni Kototoi-te Sono-himegimi-ni Muko-ya Okuran*" (Let us ask South America's Father Andes and Mother Amazon to send our groom (i.e., agricultural settlers) to their princess (i.e., fertile virgin plain)). Sakiyama sent two graduates from São Paulo to Maués to construct a branch school there. In September 1929, these two began developing a 500 hectare parcel on the west shore of the Maués-Açu River, four kilometers upstream from the Ōishi property and just across from the Amazon Enterprise Corporation (*Amazon Kōgyō Kabushiki Gaisha*) project site. In July 1930, another graduate was sent from Japan to assist in the school's construction. The Sakiyama family, a party of ten, arrived at Maués on September 22, 1932. Two other families, totalling 6 people, joined them in 1933. The people of Amazon Enterprise Corporation still remaining at Maués were encouraged by the arrival of these newcomers. In June 1933, the 52 families at Maués organized a Japanese association (*Maués Nihonjin-kai*), selecting Kosaku Ōishi and Hisae Sakiyama to be association counselors. Under their leadership, the immigrants worked together to increase

guaraná production. However, due to the handicapping isolation of the Maués region, and the success of jute plantations at Parintins, the Japanese Consulate in Belém mediated merger of the Amazon Enterprise Corporation to the Amazon Industry Corporation (***Companhia Industrial Amazonense S.A.*** = *Amazônia Sangyō Kabushiki Gaisha*) in March of 1940 (see below section of Amazon Industry Corporation).

Sakiyama was ultimately not successful in establishing the school at Maués, and his agricultural pratices depended too heavily on intensive inputs of manual labor. He nevertheless remained a farming catechist until malaria caused his death on July 24, 1941. His belief that an abundant harvest is the reward for devotion to work with prayers, remained strong to the end. His bereaved family observed his will with steadfast religious conviction, educating the children in São Paulo to insure they became good Brazilian citizens. [Yoshimura 1955, Fujii 1955, Ikushima 1959, Mishō 1976, and Han-Amazônia Nippaku Kyōkai 1994]

The Japanese Plantation Company of Brazil - Acará, Monte Alegre, Castanhal, etc., Pará

Hachirō Fukuhara, now the president of South America Development and Colonization Corporation (*Nantaku* [*Nanbei Takushoku Kabushiki Gaisha*]), left Yokohama for Brazil on

August 23, 1928, accompanied by Takami Gotanda and two other attendants. At his farewell party in Tōkyō, Fukuhara pledged he would make this enterprise successful within five years. Sanji Mutō corrected this optimistic pledge by stating that an immigration project, unlike a trading business, would require at least 20 years to produce any results. Fukuhara visited New York en route and arrived in Belém on October 7, 1928. [Ikushima 1959]

The contract deadline of South America Development and Colonization Corporation had been extended twice via mediation of the Japanese Embassy in Brazil. Due to the complicated procedures of organizing a local company, Fukuhara was forced to sign a contract with Pará government on December 30, 1928 as a private individual. This agreement adopted a format similar to the earlier contract between Ford and Pará State, with some amendments. It included the following conditions:

1) Optional land concessions
   The area granted must be measured and demarcated within two years on state-owned lands in Monte Alegre (400,000 ha), Acará (600,000 ha), Marabá (10,000 ha), Conceição do Araguaia (10,000 ha), and alongside the Bragança Railway (10,000 ha);

2) Additional privileges granted by the state
   a) priority to acquire public land (10 km each) to build access railways and roads
   b) to establish agricultural experiment stations and farms/ranches
   c) water rights for waterpower plants
   d) to open land, water, and air transportation routes
   e) to improve related harbor facilities

f) to open factories in the neighboring towns of the settlement
g) to construct a fertilizer factory
h) to develop banking infrastructure
i) to build communication services within the land granted
j) to create schools within the land granted
k) to supply commodities within the land granted
l) to receive tax exemptions for 50 years, with the provision of paying 7% of the net profits to local authorities (5% to the State and 2% to the related municipalities) after 12 years of operation
m) survey of mineral resources within the land granted;

3) Obligations of the concessionaire
a) to partition at least 25 ha for each family in newly-establish Japanese agricultural settlements
b) to survey and legally demarcate the land granted, settlement areas, and city areas
c) to build sanitation facilities in accordance with Brazilian law
d) to submit an annual plan to the state government for authorization each year;

4) Revocation of the contract
The concession may be revoked immediately without judicatory procedures if the concessionaire defaults on any of the obligations listed, or fails to choose lands within two years. No compensation shall be provided in the event of revocation.

[Izumi and Saitō 1954, Ikushima 1959]

<u>Acará concession</u>

On January 10, 1929 the Japanese Plantation Company of Brazil (***Companhia Nipônica de Plantação do Brasil S.A.***) was registered as a local subsidiary of South America Development and Colonization Corporation in Tōkyō, with 4,000 Contos (4,000,000,000 Réis ≈ US$ 400,000) of capital. On January 25, 1929 the name of the consessionaire was

transferred from that of Fukuhara to the newly-registered company. The Acará consession was designated as the first project development site. Local project headquarters and port facilities were established on the west bank of Acará Pequeno (now called Acará-Mirim) River at its confluence with the Tomé-Açu River. Today, this place is called Tomé-Açu Town (***Cidade Tomé-Açu***). It is located some 70 kilometers (km) upstream of Acará Town (***Cidade Acará***), the old municipality center, which is itself 75 km upstream of Belém along the Acará-Mirim River. [Ikushima 1959]

The Acará site construction party arrived in Brazil aboard three ships at the end of 1928, and began work on the site April 12, 1929. Surveyors entered the forest and opened a trail to partition lots for the coming immigrants. The Central Hospital building was completed on May 6, 1929, at which time Dr. Fuyuki Matsuoka took up residence there. He had worked since February 8, 1929 at a temporary clinic in the Acará municipal office prior to the hospital's construction. The company office, dormitory for the employees, vending stand, warehouse, and temporary quarters for immigrants and local laborers were all constructed by rush work. Wells were dug and and ironworks began operation shortly thereafter. [Ikushima 1959]

At a site where laborers barracks were located called Santa Maria, Katsutoshi Naitō (1895-1967) and Jūichi Ikushima (1892-1969) began growing vegetables for members of the construction party. There they also sowed seeds of tropical fruits and crops collected from the Amazon and South/Southeast Asia. In 1928 Naitō arrived in Brazil as chief of the Agricultural Division of the South America Development and Colonization Corporation. He had been a student at Pennsylvania State University, had captained its wrestling club, and had won a bronze medal in wrestling at the 1924 Paris Olympiad. Naitō would later became a successful floriculturist at Mogi das Cruzes, while introducing jūdō in São Paulo as a 4th-dan judoist (his son Katsuhiro Naitō would become chairman of the Paulista Judo Federation or ***Federação Paulista de Judô***). Ikushima had graduated from an agricultural high-school in Ōsaka, and subsequently worked on plantation farms in Malaysia, Indonesia, and the Philippines. Coming to Brazil in 1920, he participated in the founding of Aliança Settlement (***Colônia Aliança***) in São Paulo, and was appointed chief of the Research Division of South America Development and Colonization Corporation in 1929. Ikushima later worked for the Agricultural Bureau of Pará State, and the Consulate General of Japan in Belém. [Ikushima 1959, Han-Amazônia

Nippaku Kyōkai Castanhal Shibu 1975, Han-Amazônia Nippaku Kyōkai 1994]

Soon an agricultural experiment station was opened at Açaizal, producing plant species that were distributed to immigrant farmers for participatory plant growth studies (see Table 3-2). In 1930, Fukuhara ordered Jūichi Ikushima to collect seeds from useful local trees for plantation trials. Local residents laughed at the 'stupid' Japanese, planting brazilnut (*Bertholletia excelsa*), cedro (*Cedrela odorata*), and acapu (*Vouacapoua americana*), which were all abundant in the forest. However, timber resources were becaming scarce at many accessible locations along rivers and canals. The Pará government in turn adopted this practice at public research facilities. Marupá (*Simaruba amara*), cumaru (*Coumarouna odorata*), acacia (*Acacia* spp.), and brazilnut were all planted at the Northern Agronomic Institute (***IAN*** [***Instituto Agronômico do Norte***]), which is today called the Center for Agroforestry Research in Eastern Amazon (***CPATU*** [***Centro de Pesquisa Agroflorestal da Amazônia Oriental***]). [Ikushima 1959]

Meanwhile in Japan, the South America Development and Colonization Corporation dispatched emigration recruiters to rural villages, with the support of prefectural Overseas Associations (*Kaigai Kyōkai*). Annual Japanese emigration to

Table 3-2. Quantity of experimental and cultivated crops present in company and immigrant plots at Acará Concession

Crop Name	February 1933*[1]		April 1935*[2]	
	Company*[3]	Immigrants	Company*[3]	Immigrants
Abiu (*Pouteria caimito*)		29		
Acapu (*Vouacapoua americana*)			some	some
Andiroba (*Carapa guianensis*)	3,220	17	770	200
Avocado (*Persea americana*)	18	301		
Bacuri (*Platonia insignis*)		282		
Banana (*Musa* spp.)	850	16,040		
Biriba (*Rollinia deliciosa*)		792		
Black Pepper (*Piper nigrum*)*[4]	1,626	1,512	400	150
Brazilnut (*Bertholletia excelsa*)	932	790	30	30
Breadfruit (*Artocarpus incisa*)	73	231	50	50
Cacao (*Theobroma cacao*)	133,694	148,928	116,442	115,589
Cashew (*Anacardium occidentale*)	4,561	2,681	860	200
Custard Apple (*Annona squamosa*)	50			
Cedro (*Cedrela odorata*)	2,421	652	2,403	200
Coconut (*Cocos nucifera*)	339	200	219	150
Coffee (*Coffea arabica*)		311	500	300
Cupuaçu (*Theobroma grandiflorum*)		211		
Eucalyptus (*Eucalyptus* spp.)	45		100	
Freijó (*Cordia goeldiana*)	85	3	25	30
Grapevine (*Vitis vinifera*)	20	94		
Jackfruit (*Artocarpus integrifolia*)	270	496		
Kapok (*Bombax ceiba*)*[5]	2,030	31	2,000	100
Lime (*Citrus aurantifolia*)	1,258	1,630	10	200
Mango (*Mangifera indica*)	105	585	10	200
Mulberry (*Morus bombycis*)	900	9,000	5,000	6,000
Munguba (*Pseudobombax munguba*)	860	81	4,870	100
Oil Palm (*Elaeis guineensis*)	27			
Papaya (*Carica papaya*)	40	9,415		
Paradise Nut (*Lecythis pisonis*)	5,200	934	5,700	300
Passionfruit (*Passiflora edulis*)		113		
Pau Amarelo (*Euxylophora paraensis*)	12			
Pau Rosa (*Aniba rosaeodora*)*[6]	100		2,000	
Pineapple (*Ananas comosus*)	7,648	32,821		
Puxuri (*Licaria puchury-major*)	41		40	
Sandalwood (*Santalum album*)	10	303		
Sapodilla (*Achras sapota*)	5	247		
Sweet Orange (*Citrus sinensis*)	354	4,458	404	350
Tea (*Camellia sinensis*)	700		300	
Urucu (*Bixa Orellana*)	4,860	3,810	6,900	
other fruit tree species	43	67		
	(below unit in hectares)			
Cassava (*Manihot esculenta*)	1.40	68.44		
Castor-oil Plant (*Ricinus communis*)		8.40		
Corn (*Zea mays*)	14.00	60.95		
Cotton (*Gossypium* spp.)	2.50	136.80		
Peanut (*Arachis hypogaea*)	1.25			
Rice (*Oryza sativa*)		1,159.31		
Uacima (*Urena lobata*)	6.01	14.05		
Vegetables		16.55		
others*[7]				

*[1] Ichibangase (1934)

*[2] Ikushima (1959)

*[3] includes company farms at Santa Maria, Açaizal, Boa Vista, Ipitinga, and Mariquita.

Table 3-2--continued
*[4] local variety except 30 'Singapura' variety plants at the Açaizal Experiment Station.
*[5] seeds from South/Southeast Asia
*[6] seeds from upper Rio Oiapoque basin, collected by Ikushima.
*[7] Nanbei Takushoku Kabushiki Gaisha Belém-shi Tsūshin (South America Development and Colonization Corporation Report from Belém; 1932) listed soybean (*Glycine max*), feijão (*Phaseolus vulgaris*), milk vetch (*Astragalus* spp.), carapagonia (?), some clover (*Trifolium* spp.) species, and about 50 species of ornamental flower plants.

Brazil had surpassed 10,000 people by 1927, and recruiters found themselves well received by interested audiences. A film of cacao plantations, and crop samples from the Amazon including rice, beans, tobacco and wood were exhibited. For the average Japanese farmer of that time, who owned one ha of land in scattered pieces, the dream of becoming a 25 hectare lot owner was attractive. Successfully screened immigrants signed a contract with the South America Development and Colonization Corporation which specified the following:

1) a fare subsidy of ¥ 200 (US$ 93) per person from the Japanese government;

2) a minimum deposit of ¥ 300 (US$ 140) per family paid to the South America Development and Colonization Corporation for the first year's living expenses, with 5% of annual interest;

3) provision of family housing by the South America Development and Colonization Corporation;

4) a sharecropping allocation of 70% to tenants and 30% to the Corporation;

5) more than 10% of annual income deposited to the Corporation for the purchase of a lot;

6) consignment of specified crops to the Corporation for processing and marketing; and

7) charge-free endemic disease treatments.

[Han-Amazônia Nippaku Kyōkai 1994]

On July 24, 1929 the first 189 immigrants (43 families and 9 single young men) bound for Acará Settlement (***Colônia Acará***) left Kōbe aboard the Montevideo-Maru, owned by the Ōsaka Shōsen Company. This group arrived in Rio de Janeiro on September 7, 1929, and were welcomed by the fully decorated ships at the occasion of Brazilian Independence Day. Mitsuyo Maeda, now an auditor of the Japanese Plantation Company of Brazil (***Companhia Nipônica de Plantação do Brasil S.A.***), met the immigrants and accompanied them to Belém, where they arrived on September 16. The immigrants arrived at their final destination, the port of Acará Settlement (modern-day Tomé-Açu), on September 22, 1929. By the time the last pre-World War II shipment arrived there in September of 1937, a total of 2,104 people had arrived on 21 ships from Japan, comprising 352 families and some single young men. [Ikushima 1959, Mishō 1976].

Monte Alegre concession

In September of 1929 Fukuhara sent two mineralogists to Monte Alegre in the company of Jūichi Ikushima. Their job

was to demarcate 400,000 ha of land, taking into account soil fertility and any potential mine sites. In November of 1929 a construction party from the Japanese Plantation Company of Brazil (***Companhia Nipônica de Plantação do Brasil S.A.***) arrived at the Monte Alegre concession. Concession headquarters were established on the banks of the Mulata River, about 30 km north of Monte Alegre Town (***Cidade Monte Alegre***). An office, employee housing, dormitories for single young employees, a clinic, an elementary school, cotton and tobacco processing facilities, and a warehouse were built there. A sanitarium was built separately on a upland with a commanding view of downtown Monte Alegre and the Amazon River. This sanitarium is now the Monte Alegre mayor's official residence. The downtown city hall was similarly constructed by the Company. Adjacent to the headquarters area an experimental farm covering 135 ha was established, and here Hideo Nakano (1894-1936) resided as the farm's manager. Local soil was fertile and well drained, but remoteness from markets necessitated the selection of light and lucrative crops. Cotton (*Gossypium barbadense*, etc) from the Nordeste Region, herbaceous cotton (*Gossypium herbaceum*) from São Paulo and yellow-leaf tobacco (*Nicotiana tabacum*) from the USA were introduced. Ramie (*Boehmeria nivea*), and uacima (*Urena sinuata*) were also

tested. Several perennial crops were planted (see Table 3-3). The farm employed many single young men, including Tanio Oshikiri (1911-87), who was transferred there from the Açaizal Experiment Station at Acará Settlement in 1930. A Japanese agricultural settlement was established to the east of concession headquarters, at a site called Açaizal. [Ikushima 1959, Oshikiri 1981]

Table 3-3. Experimental and cultivated species at Monte Alegre Farm

Crop Name	Planted Area (ha) 1933*1	Numbers Present 1930-5*2
Andiroba (*Carapa guianensis*)		800
Cacao (*Theobroma cacao*)	7.0	6,000
Cashew (*Anacardium occidentale*)	30.0	10,000
Coconut (*Cocos nucifera*)		700
Cotton (*Gossypium* spp.)	5.0	
Curuá (*Ananas sativus*)	some	
Munguba (*Pseudobombax munguba*)		1,500
Tobacco (*Nicotiana tabacum*)	3.0	
fruit trees	some	

*1 Ichibangase (1934)
*2 Ikushima (1959)

In July of 1931, the Ōsaka YMCA Amazon Development Youth Group (*Amazon Kaitaku Seinendan*), led by Takami Gotanda and Renkichi Hiraga (1902-85), arrived in Belém. Gotanda was a Japanese Consulate secretary in São Paulo, and had been an attendant to Fukuhara when he signed the concession contract with Pará State in 1928. Renkichi Hiraga was a 1927 forestry graduate of the University of Tōkyō, and a son of Satoru Hiraga, a *Kanebō* director and promoter of the South America Development and Colonization

Corporation. The youth group's 47 members were from relatively wealthy families, and possessed the equivalent of a high-school level education today. They had been inspired by Gotanda to become immigrant leaders in the Amazon, and since May of 1930 had participated in a year-long 'pioneer training' program in Ōsaka, on a delta of Yodo River - a site hypothesized to be like the Amazon River. They had opened bush to farm, planted crops and hawked produce in Ōsaka City during the daytime, while studying Portuguese at YMCA night classes. In Belém, they practiced vegetable farming and charcoal making in the city suburbs. [Fujii 1955, Ikushima 1959, Mishō 1976]

Hachirō Fukuhara invited them to work at his Santa Rosa farm, a 300 hectare property located south of the Company headquarters at Monte Alegre. Nevertheless, these young trainees could not tolerate the hardships of frontier living, and the group disbanded by the end of 1931. While Gotanda returned to Japan, some of the young people moved to Belém or southern Brazil. Most of the group's members wound up missing. Ikeda (1965) later tracked down 3 as having died in Brazil, 5 still living in the Amazon, and 4 living in São Paulo and Paraná. Renkichi Hiraga and his wife Kiyoko Hiraga (1907-92) remained at Monte Alegre with Kōji Ueno (1911-) and Hideo Kondō (1912-), planting rice, corn

(*Zea mays*), cacao, tabacco, watermelon (*Citrullus lanatus*), and ranching some 200 cattle. In 1935, the Japanese Plantation Company of Brazil closed the experimental farm and withdrew from Monte Alegre. Then in 1938, Mitsuyo Maeda invited the Hiragas to come and help the Acará Settlement, as that concession was facing a devastating situation by poverty and endemic diseases. In 1942, the 400,000 ha concession of the Japanese Plantation Company of Brazil at Monte Alegre was seized by the Brazilian government to create an interior settlement. At the close of World War II, Ueno and Kondō still resided in Monte Alegre with Tanio Oshikiri. Oshikiri had been appointed by Monte Alegre's mayor to be the supervisor of Mulata district within the new federal settlement. After the war ended, Oshikiri moved to Tomé-Açu State Settlement (***Colônia Estadual de Tomé-Açu;*** former Acará Settlement of the Japanese Plantation Company of Brazil) in 1946, followed by Kondō in 1952. This left only Ueno at Monte Alegre, until the resumption of post-war Japanese immigration there. [Fujii 1955, Ikushima 1959, Ikeda 1965, Oshikiri 1981, Hiraga, R. 198x, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Han-Amazônia Nippaku Kyōkai 1994]

Castanhal Farm project

At the Castanhal Farm of South America Syndicate (*Nanbei Kigyō Kumiai*), sugarcane operations had been suspended because of the low market price of sugarcane spirits (***cachaça***), degradation of soil fertility, and genetic degeneration of the cane being planted there. This farm's first manager, Rokurō Fushima, had come from New York, but left shortly after his arrival. In 1929, Fukuhara decided to use a portion of Castanhal Farm as an experimental field. Katsutoshi Naitō and Jūichi Ikushima were put in charge of this project. Ikushima introduced cotton from Ceará, and sisal hemp (*Agave sisalana*) from Paraíba. He traveled extensively in the Nordeste region and the Amazon to collect plant varieties (see Table 3-4), and distributed these to the agricultural experiment stations in both Acará Settlement and Monte Alegre. Fukuhara owned three private lands named Hope Farm (*Kibōen* or ***Fazenda Esperança***) I-III near the Bragança Railway, where tree crops like cinnamon (*Cinnamomum zeylanicum*), clove *(Syzygium aromaticum*), coffee (*Coffea arabica*), and brazilnut were introduced from Castanhal Farm. In 1975, Some brazilnut trees were still found at the Commander Francisco Assis Street (***Rua Comandante Francisco de Assis***) in Castanhal Town (***Cidade Castanhal***), the former location of Fukuhara's second

farm. [Ikushima 1959, Ikushima 1960-, Han-Amazônia Nippaku Kyōkai Castanhal Shibu 1975]

Table 3-4. Experimental species planted at Castanhal Farm

Crop Name	# Present Feb. 1933*1	# Present 1933*2	Origin*2
Acapu (*Vouacapoua americana*)		some	Amazon
Andiroba (*Carapa guianensis*)	4,775	4,775	Amazon
Avocado (*Persea americana*)	556	556	
Black Pepper (*Piper nigrum*)*3	1,375	1,250	Americano & Irituia, PA
Brazilnut (*Bertholletia excelsa*)	394	85	Amazon
Cacao (*Theobroma cacao*)	762	8,256	Bahia
Cacau Peru (*Theobroma bicolor*)	1,426	1,336	Iquitos, Peru
Cashew (*Anacardium occidentale*)		some	Amazon
Cedro (*Cedrela odorata*)	4,549	2,466	Amazon
Cinnamon (*Cinnamomum zeylanicum*)		52	Bahia
Clove (*Syzygium aromaticum*)	25	15	Bahia
Coconut (*Cocos nucifera*)	260	256	
Coffee (*Coffea arabica*)	2,011	2,011	
Copaiba (*Copaifera multijuca*)	260		
Cumaru (*Coumarouna odorata*)		some	Amazon
Cupuaçu (*Theobroma grandiflorum*)	848	846	Amazon
Guaraná (*Paullinia cupana*)	472	360	Maués, Amazonas
Kola (*Cola acuminata*)	19	19	Bahia
Marupá (*Simaruba amara*)		some	Amazon
Oil Palm (*Elaeis guineensis*)		140	Belém, Pará
Paradise Nut (*Lecythis pisonis*)	54	54	Amazon
Pau Amarelo (*Euxylophora paraensis*)		some	Amazon
Pau Rosa (*Aniba rosaeodora*)		some	Alto Rio Oiapoque, AP
Puxuri (*Licaria puchury-major*)	30	30	Amazon
Quassia (*Quassia amara*)	4,200	8,439	Iquitos, Peru
Sweet Orange (*Citrus sinensis*)	1,600	1,585	
Timbó (*Paullinia pinnata* ?)		some	Amazon
Urucu (*Bixa orellana*)		some	Amazon

*1 Ichibangase (1934)
*2 Ikushima (1959 and 1960-); PA=Pará, AP=Amapá.
*3 local variety existed before the introduction of Singapura variety in July 1933 by the Japanese Plantation Company of Brazil. The original plants came in 1931 from farmyards of Americano (hamlet along the Bragança Railway) and Irituia, where Jūichi Ikushima purchased creepers on inga (*Inga marginata*) and coconut (*Cocos nucifera*) trees.

In 1929, Fukuhara invited Seitō Saibara (1861-1939) to become the new manager of Castanhal Farm, and purchased adjacent land of about 100 ha to expand it. Saibara had been a representative to the Japanese Diet and elected

president of Kyōto's Dōshisha University in 1901. In 1904 he emigrated to the US and became a 'Rice King' there on his 640 acre (260 ha) farm at Webster, Texas. Facing discrimination against Japanese in Texas, he moved to Brazil in 1917 to cultivate rice and sugarcane. In 1927, he finally achieved success with his rice plantation production at Tremembé, São Paulo. Saibara accompanied four families to Castanhal, including that of Haruyoshi Kataoka (1880-1963), an aide and in-law of Ryō Mizuno (1859-1951). Mizuno had shipped the Kasato-maru immigrants to Brazil in 1908. Saibara's efforts on Castanhal's 2,000 ha field were not fruitful, due to the inexpensive local price of rice (30,000 Réis ≈ US$ 3 per 60 kg of polished rice in 1930) and insufficient machinery to undertake large-scale cropping. In 1933, he resigned as Castanhal's manager due to his advancing age and disease, and returned to Japan. However, his passion for rice soon led him to a new farm at P'ing-tung, Taiwan, and he eventually died in 1939 at his son's rice plantation in Webster, Texas. [Ikushima 1959, Han-Amazônia Nippaku Kyōkai Castanhal Shibu 1975]

While Saibara was struggling to grow rice, the South America Syndicate in New York dispatched an administrator, Kametarō Nishimura, to Castanhal in 1930. Nishimura tried to grow an aromatic herb (cited as *Arisumēka* in Japanese but unidentified) for export to the USA, which did not produce a

satisfactory result either. [Ikushima 1959, Han-Amazônia Nippaku Kyōkai Castanhal Shibu 1975]

Given the Company's agricultural difficulties in Castanhal, Fukuhara enlisted the help of his younger brother, Shichirō Motoki, who came from Japan to Castanhal Farm in 1934. By the end of that year, Castanhal boasted the first five black pepper plantations in the Amazon, each having 1,000 plants of local derivation (Fukuhara Hope Farm I was planted in 1931, while Kataoka, Motoki, Nishimura and Fukuhara Hope Farm III were planted in 1934). Fukuhara ordered Shin'ichi Satō (1902-91) to study black pepper culture at his third farm. Satō had graduated from the Tokyo University of Agriculture and was an ex-trainee of the Amazônia Institute (***Instituto Amazônia***) at Parintins, Amazonas. He later introduced the Southeast Asian variety of black pepepr to Castanhal. Close to Fukuhara's first farm, Mitsuyo Maeda had a lot where Michio Karaki established a poultry farm. Karaki was a member of the construction party of Amazon Enterprise Corporation at Maués, Amazonas. Karaki and Satō later became the founders of a modern poultry operation in the vicinity of Belém. In April of 1935, the Japanese Plantation Company of Brazil closed Castanhal Farm. Kataoka and Motoki stayed there to cultivate their own plots, while monitoring the experimental field. However, at the onset of the Pacific War in 1941,

the Farm was confiscated by Pará State, and was reassigned to local residents. All experimental perennial plants were destroyed to produce ash for slash-and-burn agriculture by the locals. [Ikushima 1959, Ikeda 1965, Han-Amazônia Nippaku Kyōkai Castanhal Shibu 1975]

Other locations

The Japanese Plantation Company of Brazil and its associates had access to some other concession lands and some privately purchased lands. All concessions were, however, annulled due to the Pacific War, before the Company could actually do anything on the following sites.

1) Marabá (The Company consession)
Jūichi Ikushima was dispatched to Marabá to demarcate 10,000 hectares of land in June of 1931. The mayor of Marabá, then visiting Belém, accompanied him to show him brazilnut forests and cattle ranches. The candidate demarcation site was chosen behind the town, along the Itacaiúnas River.

2) Conceição do Araguaia (The Company consession)
Jūichi Ikushima ascended the rivers beyond Marabá. He stayed in a Jesuit monastery, and searched the environs of Conceição do Araguaia Town before choosing a 10,000 ha site on the upper reaches of the Araguaia River. He returned to Belém in October of 1931.

3) Along the Bragança Railway or ***Zona Bragantina*** (The Company consession)
Jūichi Ikushima was sent to Viseu in December of 1931. He found fertile soil on the west bank of the Gurupi River, and an alluvial gold mine called Mina de Macaco on the upper Piriá River. However, the area was 70 km away from the Bragança Railhead. The Company then sent Ikushima to investigate another location between Capanema and Salinas (now called Salinópolis). There he found limestone strata and demarcated 10,000 ha between Igarapé Vermelho River (note: 'igarapé' means small river) and the Pirabas River.

4) Amapá (Sanji Mutō's concession)
In November of 1930 the revolutionary government of Getúlio D. Vargas dispatched Joaquim de Magalhães Cardoso Barata (***Interventor Militar*** 1930-35, ***Interventor Federal*** 1943-45, Governor 1956-59) to be the administrator of Pará. He encouraged Fukuhara to survey the Amapá area, in the hopes that fertile soil and rich mineral resources might be found there. The French had mined ironstone there in former times. Jūichi Ikushima accompanied the Administrator Barata to the inauguration of the road between Macapá and Porto Grande. From there he ascended the Amapari River to Serra do Navio Village. Soil and mineral samples that included manganese were shipped to Tōkyō for analysis. With instructions from Sanji Mutō, Fukuhara requested that Administrator Barata grant a 100,000 ha land concession. A strip of land 10 km wide was granted, and extended from the upper Matapi River for 100 km upstream along the south bank of the Amapari River.

5) Xingu (Hachirō Fukuhara's concession)
In 1930, the mayor of Altamira asked Fukuhara to survey minerals and elements like crystal, coal, and lead along the Fresco River. Fukuhara dispatched Jūichi Ikushima to collect samples for analysis in Japan. When lead content of the samples proved to be significant, Fukuhara visited the site along with Ikushima and two agronomists. On April 25, 1933, Fukuhara signed a land concession contract with Pará State, for 50,000 ha between Vitória do Xingu and Altamira, and also for 250,000 ha at São Félix do Xingu, along and not more than 20 km away from both banks of the Fresco River. The concessionaire was granted privileges similar to those of the Japanese Plantation Company of Brazil, including 20 years of tax exemption. Contract responsibilities included opening settlements for Japanese and Brazilians within 5 years of the project's commencement, and assigning at least 25 ha to each settlement family. At this same time Acará Settlement faced severe economic problems. In a desperate effort on behalf of the Acará Settlement, Fukuhara went to Japan in late 1933 to convince South America Development and Colonization Corporation stockholders of ultimate success in mining at the Xingu concession. He returned to Belém in 1934 with ¥ 1,250,000 (US$ 368,732) of second stock payments, money which should be invested to the Xingu concession, but diverted to help Acará Settlement with little success. Two mineralogists from the Mitsubishi Corporation in

Japan were also invited to do a detailed site survey of the Xingu concession, however they judged the mine unprofitable due to exorbitant transportation costs.

6) Capanema (Saburō Chiba's property)
In 1930, Fukuhara ordered Jūichi Ikushima to find farmlands for seven Japanese families in Belém, who were all '*taikōsha*' (literally evacuated cultivators or those who abandoned their farms) from Acará Settlement. Ikushima selected a place near Igarapé Vermelho River, along the road between Capanema and Salinas (now Salinópolis). Saburō Chiba, a director of the South America Development and Colonization Corporation visiting the Japanese Plantation Company of Brazil projects at that time, purchased the land for the seven families. Japanese families there increased in number to 30 families by 1936, due to curtailment of the Company operations at Acará Settlement in 1935, that caused more people leaving the interior settlement in economic difficulties.

7) Salva Terra (Hachirō Fukuihara's property)
In the early 1930s, Fukuhara purchased land for 'sanitarium' of the Japanese Plantation Company of Brazil to assist 10 young single men who were led by Rokurō Shinoda. Shinoda was a member of the Uetsuka Mission, that had come to Parintins, Amazonas in 1930 to take over the Yamanishi-Awazu Concession. These young people originated from various places, but came together to produce vegetables and watermelon. Shinoda himself became a pioneer of viniculture in the Amazon, employing organic fertilizer made from stranded fish. His first grape harvest was sent to Belém in 1937. Shinoda later moved to São Paulo, while the others again scattered to different places.

[Ikushima 1959, Nagao 1965, Han-Amazônia Nippaku Kyōkai 1994]

The Yoshio Yamada Group (Maeda Concession) - Ourém (today's Capitão Poço), Pará

Yoshio Yamada (1898-1973), a young entrepreneur and 4th-dan judoist, was traveling around the world (ca. 1926-27) to find a place to succeed overseas. He finally

arrived in Brazil and met Mitsuyo Maeda, who had been his upperclassman at Waseda University in Tōkyō. Maeda introduced Yamada to João Augusto Cavaleiro (who was living in Rio de Janeiro), who still harbored the idea of bringing Japanese farmers to the land concession in Pará, despite past unsuccessful negotiations with the *Kanebō* and South America Development and Colonization Corporation. Yamada went back to Japan, and returned to Brazil in 1928 with his comrade Sōkichi Muramatsu. Together they visited Cavaleiro, and then in November of 1928 both went to see the concession lands in Ourém. Muramatsu did not approve of site and contract conditions and withdrew from the project, to later join the Japanese Plantation Company of Brazil in Acará Settlement.

In April of 1929, Yamada and Cavaleiro signed a partnership contract in Rio de Janeiro. In the contract Yamada was responsible for establishing a farm development corporation in Japan by June of 1930, and Cavaleiro was responsible for demarcating land and doing all necessary surveys by July of 1933. Cavaleiro was also to be lifetime director of the project. However, Yamada was unsuccessful in finding sponsors in Japan, while the Cavaleiro Concession was revoked in February of 1931 by State Administrator Joaquim de Magalhães C. Barata of the revolutionary government. Mitsuyo Maeda sent an encouraging letter to

Yamada, stating that he would be happy to offer his land concession for Yamada's project. This area encompassed 26,036 hectares in Ourém (today's Capitão Poço) and was located on the south bank of the Guamá River, just across the river from what had been the Cavaleiro Concession. Maeda's concession had been granted by former Governor Dionysio A. Bentes in April of 1929, as a reward for Maeda's contributions in establishing Japanese projects in Pará. The revolutionary government had in turn extended recognition of this concession. Thanks to this letter from Maeda, Yamada gained support from the Japanese Ministry of Foreign Affairs. He made a hasty round trip to Brazil to demarcate land and discuss other details with Maeda. In October of 1931, Yamada left Japan accompanied by his family and some young comrades. He had received a ¥ 50,000 (US$ 24,390) subsidy from the Japanese Ministry of Colonization. Including several local young single Japanese, this group of 10 persons settled the Maeda Concession to plant rice, corn, cassava and tobacco. However, due to malarial illness, infertile soil, and the barren frontier environment, most of these people left within several years. Yamada then opened a grocery in Ourém. In 1939, the Yamada family moved to Belém, selling vegetables and charcoal that they produced in Belém's suburbs. In August of 1942, the Yamadas were interned in the Acará Settlement concentration camp with

other Japanese. When released after World War II, they moved to a new farm in Mosqueiro Island. There the family founded a company in 1952, which would grow into the Grupo Y. Yamada, one of the major retailers in Pará. By 1995 it consisted of 23 affiliates and 1,800 direct employees. [Yamada 1958, Ikushima 1959, Mishō 1976, Han-Amazônia Nippaku Kyōkai 1994, Governo do Estado do Pará 1995]

The Amazon Industry Corporation - Parintins, Amazonas

Yamanishi-Awazu Concession

The Governor of Amazonas, Ephigênio de Salles, had been disappointed that the Fukuhara Mission had not visited his state. On October 20, 1926 he asked the Japanese Embassy to send another scientific mission before June of 1927, in order that Japanese immigrants be settled during his term in office. [Ikushima 1959]

In December of 1926, a young entrepreneur named Genzaburō Yamanishi arrived in Brazil looking for business opportunities. He carried with him an introductory letter from Tsukasa Uetsuka (1890-1978) addressed to Kinroku Awazu (1893-1979) in São Paulo. Uetsuka was a politician who had been intermittently elected to a representative of the Japanese Diet since 1920. He had also been an aide to Korekiyo Takahashi (1854-1936; prime minister 1921-22, minister of agriculture and commerce 1924-25, minister of

finance 1927-29 and 1931-36). Uetsuka had a cousin in São Paulo, Shūhei Uetsuka (1876-1936), a *Kasato-maru* immigration agent known as 'the father of Japanese immigrants in Brazil.' Uetsuka and Awazu originated from the same prefecture of Kumamoto, and had been schoolmates at what is today the University of Kobe. At the suggestion of the Japanese Embassy staff, Awazu accompanied Yamanishi to Amazonas, and orchestrated a 1,000,000 ha concession with his acquaintance, Governor Ephigênio de Salles on March 11, 1927. This Yamanishi-Awazu Concession was given the option to select and demarcate land from four distinct sites along the Amazon River (around Parintins), Negro River, Solimões River, and Madeira River over a two year period. After land selection, the concessionaire had to establish a locally-based company within one year, to which the state would issue definitive land titles without duties. The state would also guarantee; 1) 10 years of state tax exemptions; 2) prior mining rights within the concession; 3) less than 3% of agricultural export taxes; and 4) rights to transportation development and water power generation. In return, the new company was obligated to: 1) settle at least 10,000 families within 50 years; and 2) maintain continuous immigration after the arrival of the first 300 families. Six months of interrupted immigration would be grounds for suspension of all privileges granted by the state, while a

two-year interruption would lead to forfeiture of all unutilized lands. Yamanishi immediately returned to Japan and published 'Brazil - The Land for Solving Our Population, Food and Natural Resources Problems (*Wagakuni Jinkō Shokuryō oyobi Shigen Mondai Kaiketsuchi to shiteno Nanbei Brazil*)' in August of 1927, and then 'The Amazon Basin (Amazon Ryūiki)' in October of 1927. These two books appealed for support by influential Japanese for his immigration and development plan in Amazonas. However, the Japanese economy was weak due to the Financial Crisis of 1927, and Yamanishi himself suffered significant personal business losses. Yamanishi and Awazu had no choice but to entrust this plan to Uetsuka. [Izumi and Saitō 1954, Fujii 1955, Ikushima 1959, Ikeda 1965, Mishō 1976, Noguchi 1990, Han-Amazônia Nippaku Kyōkai 1994]

The first survey mission

Uetsuka's political connections facilitated a subsidy from the Ministry of Foreign Affairs of ¥ 10,000 (US$ 4,651), according to Ikushima (1959), while Mishō (1976) cited the sum to be ¥ 25,000 (US$ 11,628). This subsidy was for the first survey mission in Amazonas. Awazu was appointed to lead this mission, which left Japan in August of 1928 and reached its destination in December of 1928. In Belém, several employees of the Japanese Plantation Company of Brazil including the physician Dr. Fuyuki Matsuoka,

agronomist Katsutoshi Naitō, and Osamu Hoshino (1906-96) joined the mission to help Awazu. This group chose an optional piece of land near Parintins, and demarcated 300,000 hectares there. The survey mission's contract was then extended for two more years, to demarcate the remaining 700,000 hectares. Awazu returned to Japan in January of 1930, aboard the same ship as lecturer Kotarō Tsuji (1905-70) of what is today the University of Kōbe. Tsuji was a junior to Uetsuka and Awazu at that university. Tsuji had been carrying out a Japanese Ministry of Education funded 18-month travel investigation in Brazil, including the Amazon. During the return voyage, Awazu and Tsuji discussed promising commercial crops for the Amazon. Awazu stressed the promise of brazilnut, coffee and rice, while Tsuji insisted on the potential of jute. Tsuji cited the small domestic rice market in the Amazon, overproduction of coffee, and 10 years of waiting for brazilnuts as limitations associated with Awazu's preferred crops. In contrast, there was high demand for jute in Brazil, and it could be harvested annually. The Fukuhara Report of 1927 (see section Post-Rubber Boom Land Concessions and the Japanese Responce) had also discussed the high potential of jute cultivation in the rich Amazonian floodplain soil. Tsuji had acquired jute seeds from the Agricultural Bureau in São Paulo State, and left them with Noboru Yamanouchi

(1907-) at Maués for experimental planting. Uetsuka called on both Awazu and Tsuji for briefings about local conditions in Brazil. He then proposed to the Ministry of Foreign Affairs the need to send a second survey mission. Uetsuka was appointed leader of this mission, and provided with a ¥ 50,000 (US$ 24,631) subsidy in February of 1930. [Izumi and Saitō 1954, Fujii 1955, Ikushima 1959, Ikeda 1965, Mishō 1976, Noguchi 1990, Noguchi 1993, Han-Amazônia Nippaku Kyōkai 1994, Governo do Estado do Pará 1995]

Japan Colonization High School

Before leaving, Uetsuka founded a colonization school called *Kokushikan Kōtō Takushoku Gakkō* in Tōkyō in April of 1930, and invited Kotarō Tsuji to be the school's chief instructor. In 1932 this school was renamed the Japan Colonization High School (*Nihon Kōtō Takushoku Gakkō* = ***Escola Superior de Colonização do Japão***), when it was moved to Ikuta, which is today called Kawasaki City, in Kanagawa Prefecture. This institution had the specific objective of training future immigrant leaders in the Amazon. It had one continuous school year, no seasonal vacation, and the following weekly curriculum: 24 hours of farm practice, 15 hours of Portuguese, 2 hours of South-American economy, and an hour each of moral study, colonization history, colonization policy, South-American geography, agriculture, animal husbandry, civil engineering, surveying, agricultural

cooperatives, martial arts (*Jūdō* or *Kendō*), horsemanship, and drill. School graduates were expected to take another year of training once in the Amazon, apart from their farm development tasks. This on-site training included a weekly regimen of 14 hours of Portuguese, and one hour each of moral study, South-American economy, tropical hygiene and Brazilian law. [Izumi and Saitō 1954, Fujii 1955, Ikushima 1959, Ikeda 1965, Mishō 1976, Noguchi 1993]

The second survey mission (Uetsuka Mission)

Uetsuka left Kōbe on June 7, 1930, and arrived in Rio de Janeiro on July 22, 1930. The survey mission was divided into two parties in São Paulo during August of 1930. The first survey party included Uetsuka, Awazu, and 12 other experts of agriculture, surveying, civil engineering, medicine, etc. The second survey party of 9 members stood by in São Paulo, waiting to be called by the first party after the latter chose a field headquarters location. Uetsuka and the first party arrived in Manaus on September 19, 1930. Having hired a local steamer and loaded it with construction materials, they entered Parintins on September 28, 1930. While demarcating 700,000 hectares, the surveyors selected the mission's future headquarters at Vila Batista. It was located east of Parintins across the Paraná do Ramos River (note: 'paraná' means canal), facing the Amazon River to the north. Uetsuka made a quick round trip to Manaus and

purchased this 1,300 hectare farm from its owner on October 18, 1930. A ceremony was held to place the foundation stone of the Amazon Industry Research Institute (***Instituto Amazônia*** = *Amazônia Sangyō Kenkyūjo*) on October 21, 1930, at which time the site's local name was changed to 'Vila Amazônia.'

On October 24, 1930, Uetsuka, Awazu and 6 other members of the mission returned to Manaus. There they visited the state governor, Dorval Pires Pôrto (term 1929-30) to notify him of their land demarcation and make an appointment to begin detailed negotiations the following day. However, as the news of the Getúlio Vargas Revolution in Rio de Janeiro reached Manaus that very night, the city fell into turmoil. The state government was seized by revolutionists, and Álvaro Botelho Maia (1893-1969; ***Interventor Federal*** 1930-31, governor 1935-36, ***Interventor Federal*** 1937-45, governor 1950-54) was appointed administrator on November 20, 1930. Uetsuka went to see the administrator on that day and requested reconfirmation of the Yamanishi-Awazu Concession. While dozens of other previous concessions were revoked, the administrator recognized this concession to be beneficial for regional development and granted the entire area, along with an extension of the deadline for establishing a local company until March 10, 1934. [Izumi and Saitō 1954, Fujii

1955, Ikushima 1959, Ikeda 1965, Mishō 1976, Noguchi 1993, Han-Amazônia Nippaku Kyōkai 1994]

Construction of Vila Amazônia

The Amazon Industry Research Institute slowly took shape under the supervision of its Vice-Director Kinroku Awazu, who remained on site with members of the mission's second survey party (Director Uetsuka was based in Tōkyō, Japan). The Institute had four divisions: the Agricultural Experiment Station, the Meteorological Station, the Central Hospital, and the Training Center. From 1931-37, Vila Amazônia received 248 graduates (1st-7th year) from the Japan Colonization High School, who would be referred to as '*Kōtakusei*' (an abbreviation of Colonization High School Students) for the remainder of their lives. Additionally, about 270 other people arrived by 1939, including employee families, *Kōtakusei* spouses, and 11 farming families. This group assumed the role of construction party for so-called 'model settlements.' They were to create a new civilization on the last frontier of the world, which was Uetsuka's dream. He inspired these young *Kōtakusei* to become both moral and occupational leaders for subsequent Japanese immigrants and local Brazilian farmers. In terms of agricultural development, the Institute had two agricultural foci: upland (***terra firme***) sites, which more interested Awazu; and flood plains (***varzea***), which attracted Uetsuka

and Tsuji. *Kōtakusei* and others took on upland forests with sheer manpower, planting upland rice and cassava, intercropped with tree species such as brazilnut, rubber tree, guaraná, and cacao. In a report to the Japanese government, Ichibangase (1934) listed the planting of 25 ha of rice, 2 ha of beans and vegetables, 1,500 brazilnut trees, 3,000 guaraná vines, and other sites that included coffee, sisal, curuá (*Ananas sativus*), uacima, and castor-oil plant (*Ricinus communis*). Yamane (1980) cited that by 1942 Vila Amazônia possessed 100 ha of brazilnut plantations and 400 ha of rubber tree plantations. In flood plain areas, jute was repeatedly planted, but with little success. Apart from this unsuccessful cropping in flood plains, the different philosophies of Uetsuka and Awazu were further highlighted by a chronic insufficiency of working capital. This was caused by a lack of corporate backup. While Uetsuka stuck to his original ideas of leadership training and the creation of a new civilization, Azawu wanted to create a more systematic and mechanized project, supported by large capital inputs through governmental subsidies. On December 7, 1932 Awazu resigned and left for São Paulo. [Izumi and Saitō 1954, Fujii 1955, Ikushima 1959, Mishō 1976, Yamane 1980, Pará Kōtakukai 1990, Noguchi 1993, Han-Amazônia Nippaku Kyōkai 1994, Yasui 1998]

Amazon Industry Research Institute Foundation

Meanwhile, Uetsuka toured around Japan, attempting to establish a company for his project in the Amazon. He began publishing a Monthly Report of the Amazon Industry Research Institute (*Amazônia Sangyō Kenkyūjo Geppō*) in August of 1931, to attract the attention of potential supporters. This monthly report would continue to be published until December of 1941. However, the Manchurian Incident commenced soon thereafter, on September 18, 1931, and became an immediate national preoccupation. Uetsuka's efforts were further hindered by adverse information about Vila Amazônia that Awazu reported to the Japanese Embassy in Brazil.

The Japanese Ministry of Foreign Affairs advised Uetsuka to reformulate his plan, and establish a foundation before proceeding to corporate formation. On February 8, 1933 the Amazon Industry Research Institute Foundation (*Zaidan Hōjin Amazônia Sangyō Kenkyūjo*) was founded (registered on February 15, 1933), with Uetsuka as the chairman of its board. Saburō Chiba, an aide of Sanji Mutō and a director of South America Development and Colonization Corporation, became a member of this board of directors, with the task of coordinating the two Amazonian projects. On April 6, 1933 the concessionaire designation in Amazonas was changed from Yamanishi and Awazu to Uetsuka. On May 10, 1933 Kotarō Tsuji arrived at Vila Amazônia to become the new

manager in charge of reorganizing this project in crisis. The greatest challenge was to mollify the desperate, young *Kōtakusei*, many of whom originated from notable families. Disillusioned by the challenges of a harsh pioneer environment, and agitated by discontented leaders, this group became rebellious and even violent. Since it was unrealistic to establish a local company for the Amazon Industry Research Institute by a March 10, 1934 deadline, Uetsuka petitioned to have this deadline extended. The Amazonas government did grant an extension until March 10, 1936, which was formalized on February 12, 1934. A modification of concession areas was also granted simultaneously: an exchange of 300,000 ha in the environs of Maués-Açu River, Paraná Urariá River and Abacaxis River for the same amount of land on the south shore of the Amazon River, between Parintins and Juruti. This new site was a former German concession, and was a well-drained upland east of the Mamuru River, up to the old border of Pará (ca. longitude 56° W). The remainder of the concession still included: 400,000 ha circumscribed by the Mariaquã River, Mamuru River, Paraná do Ramos River, Maués-Açu River, and Urupadi River; 200,000 ha at Tabocal, in the center of Tupinambarana Island and surrounded by the Amazon River, Paraná do Ramos River, Maués-Açu River, Paraná Urariá River and Arari River; and 100,000 ha at Carvalho, on the north

shore of the Amazon River down to Urucará. [Ikushima 1959, Ikeda 1965, Chiba 1977, Yamane 1980, Noguchi 1993, Han-Amazônia Nippaku Kyōkai 1994]

Ryōta Oyama and the new jute variety

Ryōta Oyama (1882-1972) arrived at Vila Amazônia with his family on November 19, 1933. Oyama came from Okayama prefecture, an area famous for rush (*Juncus effusus* var. *decipiens*) and *tatami* floor mat production. He graduated from an agricultural school, and joined study circles concerned with rush culture and agricultural policy. Before emigrating, he published a local agricultural newspaper called *Nōgyō Shinpō*. Possessed by politics, he sold his ancestral farmlands to finance his bid for election to local office. He had been active as the chief prefectural campaign stumper of the Constitutional Association Party (*Kenseikai*), and knew some ex-prime ministers personally.

Probably through these past associations, Oyama became acquainted with Uetsuka, and made himself the Okayama branch boss of the Amazon Industry Research Institute. Oyama's eldest son, Kazuma, was a *Kōtakusei*. In December of 1933, the Oyama family settled at the Ângela Settlement (***Colônia Ângela***), and planted jute in their floodplain lot across the Paraná do Ramos River. This was the seventh experimetnal planting done by 140 people on 30 ha, using 60 kg of smuggled 'premium' seeds from India. Kotarō Tsuji received

the seed in Ceylon from the Mitsui & Co, Ltd (*Mitsui Bussan*), with the help of the Japanese Consulate General in Calcutta. Most people, however, had already lost interest in planting jute, since it always grew to only about 1.5 m in height. During the March 1934 harvest season, when the periodic floods returned, Oyama found two plants that had outgrown all others, without branching. He ordered his third son, Tamon, to protect the plants from driftwood with supports made of 4 logs tied by lianas. Each morning Tamon crossed the river in his canoe with his fishing tackle, to watch the plants all day long. As the river swelled, one plant was washed away. The other also fell into the water, but grew to nearly 3 m, and bore 10 fruits by April of 1934. Oyama collected a pinch of (some documents cite 12) seeds from this plant. Uetsuka visited Vila Amazônia on October 17, 1934, and heard of this news. Encouraged by Uetsuka, Oyama sowed the seeds in the yard of his home on the upland on October 20, 1934. The results of this second generation of planting was favorable, as plants attained average heights of 3 m, with a maximum of 3.65 m. In July of 1935 Oyama brought his jute seeds to the Amazon Industry Research Institute for further propagation and experiments. In 1936, Uetsuka named this the 'Oyama Variety' jute, and distributed seeds to Oyama and Yoshimasa Nakauchi for initial commercial production. [Izumi and Saitō 1954, Kuroda 1976, Fujii 1955,

Ikushima 1959, Ikeda 1965, Mishō 1976, Yamane 1980, Pará Kōtakukai 1990, Noguchi 1993, Han-Amazônia Nippaku Kyōkai 1994, Governo do Estado do Pará 1995]

Amazon Industry Corporation

On March 25, 1935 the Japanese Diet passed a bill to subsidize ongoing immigration projects in Brazil. Eligibility for subsidies was limited to companies that: a) managed settlements directly or through local companies; b) had official permission from the Brazilian government; and c) planned to settle more than 10,000 Japanese immigrants within 10 years of registration. Eligible companies would receive subsidies equalling 6 percent of their annual investments every year for 10 years, beginning in 1936, with a total subsidy not to exceed ¥ 2,500,000 (US$ 714,286) per company. Helped by this bill, and Oyama's agronomic serendipity, establishment of the Amazônia Industry Corporation (*Amazônia Sangyō Kabushiki Gaisha*) was finally approved by a meeting at the Japanese prime minister's official residence on September 17, 1935. Finance Minister Korekiyo Takahashi represented the government, along with the Ministers of Foreign Affairs and Colonization. From business circles Masanosuke Gō, Chairman of the Japanese Chamber of Commerce and Industry (*Nihon Shōkō Kaigisho*), accompanied representatives of the 'big five' corporations, namely Mitsui, Mitsubishi, Sumitomo, Yasuda, and Totaku

(*Tōyō Takushoku*). On September 23, 1935 an organizing committee meeting was held by the corporation's promoters, during which Uetsuka was nominated president of the new corporation, and provided with initial capital of ¥ 1,000,000 (US$ 285,714). The local company was registered at Parintins on February 4, 1936 as the Amazon Industry Corporation (***Companhia Industrial Amazonense S.A.***), with capital resources of 4,000 Contos (4,000,000,000 Réis ≈ US$ 254,000). Kotarō Tsuji took office as the managing director, and Mitsuyo Maeda became a director.

Just as the project was finally getting under way, Uetsuka lost his major domestic supporter in Japan, Korekiyo Takahashi, as a casualty of the February 26, 1936 military coup d'etat (*Nī-nī-roku Jiken*). Takahashi was the prime target of the coup, due to his policies of limiting armaments expansion. In addition, Uetsuka's vested interest in the concession became a political issue in Brazil that same year. The Amazonas state government followed formalities outlined in the 1934 Constitution, which prescribed that all land concessions over 10,000 ha must be screened by the Senate (Article 130). Leopoldo Tavares da Cunha Mello (1891-1962), senator from Amazonas, was an anti-Japanese leader representing local business interests who did not approve of the Uetsuka Concession. He successfully nullified the concession on August 24, 1936, in

a plenary meeting conducted in closed session. Uetsuka felt that to appeal this ruling to the Brazilian Supreme Court would be futile. This was a period of rising nationalism. Japanese military aggression in China, beginning in 1931 with the Manchurian Incident, helped legitimize a Brazilian anti-Japanese initiative in the Brazilian constitution placing limits on Japanese immigration (Supplementary Article 6). In any case, the concession face value of '1,000,000 hectares' was no longer that attractive to corporate sponsors, who were sobered by the difficulties of the Japanese Plantation Company of Brazil (see section Development of Acará Settlement). The Japanese economy had also recovered, having been placed on a war footing. In addition, most accessible fertile lands along the rivers in Amazonas were already 'owned' (regardless of titles), for which cash purchases had to be paid after all. Uetsuka thereafter decided to focus his efforts on crop development and marketing, rather than pursue legal claim to the nullified concession. [Izumi and Saitō 1954, Ikushima 1959, Ikeda 1965, Noguchi 1993, Han-Amazônia Nippaku Kyōkai 1994]

Rise of the Amazon Jute

In April of 1937 the first 60 bales (2,770 kg) of 'Amazon Jute' fiber were shipped to Belém. Martin Jorge & Co. experimented with this fiber at their Fábrica Perseverança, accepted all grading of the Amazon Industry

Corporation, and paid 20-40 percent more than offered prices. A second shipment of 6,171 kg was made in July of 1937, most of which was sold at 1,400 Reis (≈ US$ 0.08) per kilogram FOB. This value stood for 70 percent of the local daily wage of that period. Oyama reported that he earned about 100 percent of his production costs as profit. In May of 1938 Brazilian newspapers simultaneously announced the cultivation of jute in the Amazon. Both the public and government representatives praised this achievement with surprise. In order to export Brazilian coffee and other agricultural products, Brazil needed gunny sucks made of British jute fiber from India. All previous efforts to develop alternative domestic sources of fiber had failed. Due to the impending war in Europe, increased Brazilian cotton and grain exports required more sacks at higher prices. In 1937, about 34,000 tons of jute fiber was imported at a cost of £ 565,000 of gold.

The Pará state government asked Kotarō Tsuji to introduce jute there in June of 1938. A concession contract was signed on September 5, 1938, and the Amazon Industry Corporation opend a jute experiment station at Breves on September 9, 1938 (later moved to Santo Antônio, Santarém, in September of 1940). Pará State subsidized these experiments for three years, and offered 10,000 ha for the establishment of a jute company within the state. Tax

exemptions for 20 years, and cost-free transportation of immigrants and laborers were also provided. Stimulated by this move, the Amazonas state government issued a decree on November 24, 1938, granting a 10,000 ha land concession, and 30 years of state and local tax exemptions for the jute industry of the Amazon Industry Corporation. Beginning in 1940 Kotarō Tsuji focused on the expansion of jute cultivation among local Brazilians. Due to limitations of both available floodplain land and workforce, Japanese model producers were dispersed 800 kilometers (500 miles) along the Amazon River, from the confluence of the Purus River and Solimões River to Monte Alegre, and 480 kilometers (300 miles) along the tributaries of the Amazon River.

On October 9, 1940 President Getúlio D. Vargas visited Amazonas and stopped at Parintins on his seaplane. Uetsuka and Tsuji were introduced by the mayor to the president, and explained to him the history of Amazon Jute. They suggested a grading regulation for jute fiber, to promote it as an international commodity. The president asked them to send such a proposal to the Ministry of Agriculture. On February 7, 1941, Decree No. 6825 was promulgated, appointing the Amazon Industry Corporation as the legal jute fiber grader. A large grading and packing yard was planned for Santarém, Pará, with a subsidy from the Brazilian government. Uetsuka formulated plans for a jute factory there, having 2,500 tons

of annual capacity, and producing 5,000,000 gunny sacks. However, due to the Pacific War, the Amazon Industry Corporation was dissolved. Kotarō Tsuji left Vila Amazônia for Santarém, Pará, to become a jute farmer on a small island. By the end of 1942, all other remaining directors had been sent to Acará Settlement for house arrest. Vila Amazônia was seized by the state government, and sold to J.G. Araújo Corporation (***J.G. Araújo & Cia.***) for only 700,000,000 Réis (≈ US$ 32,000), via a secret negotiation. While bank deposits were blocked, Japanese jute producers were still free to continue production (see Table 3-5). An established gunny sack maker from Taubaté, São Paulo, came to dominate the Amazon jute industry during World War II.

Due to the Japanese occupation of Malaysia, demand for rubber latex by US military industries created a second rubber boom (Rubber War or ***Batalha da Borracha***). This boom also required more jute fiber for packaging of latex exports. The southern capital of São Paulo organized Japanese as ***aviadores*** in jute collection. They functioned as traditional middlemen, advancing commodities to Brazilian farmers in exchange for their products. This monopoly situation ended with the war, when local capitals simultaneously turned from rubber to jute production. Some Japanese worked on jute variety improvement with the Northern Agronomic Institute (***IAN*** [***Instituto Agronómico do***

Norte], today's ***CPATU***), where varieties like Roxa, Bamboo, and Tanaka (Liso) were developed, all based on Oyama Variety. [Izumi and Saitō 1954, Fujii 1955, Ikushima 1959, Ikeda 1965, Mishō 1976, Tsunoda 1977, Pará Kōtakukai 1990, Han-Amazônia Nippaku Kyōkai 1994, Governo do Estado do Pará 1995, Yasui 1998]

Significance of the Amazon Jute and its fate

Table 3-5 shows that jute production was carried out by small Brazilian farmers, planting 1 to 2 ha per family. Homma (1995) argues that this was an epoch-making event in the Brazilian Amazon, where extractive rubber and brazilnut forests had been previously dominated by a few large landowners. The surplus rural labor force of latex extraction turned to intensive jute cultivation after the decline of rubber. While official agricultural extension services were absent until the end of 1960s, the river bank dwellers (***riberinhos***) quickly mastered the planting and processing technology introduced to them by Japanese immigrants.

Jute initiated industrialization of the Amazon with fiber factories, which in turn led to enhanced valuation of malva (*Urena lobata*), a weedy local plant extracted and planted by rural residents (Homma 1995). Malva fiber was blended in jute fiber products (Ikushima 1960-). The fiber industry linked regional economies of Brazil's North and

Table 3-5. Plant fiber production in the Brazilian Amazon and Japanese contributions

Yr.	*Kōtakusei* families	*Kōtakusei* ha	Other Jap. families	Other Jap. ha	Brazilian families	Brazilian ha	Jute Production (t) Amazonas	Jute Production (t) Pará	Jute Production (t) ES/AP	Malva Production (t) Amazonas	Malva Production (t) Pará	Malva Production (t) MA	Related Events
1930	Noboru Yamanouchi at Maués tried jute variety of São Paulo, with seeds entrusted from Kotarō Tsuji												
1931	Experiments of varieties from Japan, Brazil and India at ***Instituto Amazônia*** (1-1.8m)												
1932													
1933	Experimental cropping of Indian varieties at ***Colônia Ângela*** by *Kōtakusei* & others (0.2 ha x 140 people)												
1934	Ryōta Oyama found 2 mutational plants (3-4m)*[1]												
1935											270		
1936											350		*CIA**[3] founded
1937			*[2] 2	8			9				720		
1938	28	50	3	10			58	5			1,080		
1939	39	166	3	12			168	18			1,500		World War II began
1940	50	335	5	15			325	52			2,120		
1941	74	940	22	60	182	415	938	280			2,740		Pacific War began
1942	74	1,000	22	80	5,000	2,800	2,770	915			3,325		*CIA**[3] dissolved
1943	74	1,200	22	160	6,000	3,188	3,224	2,199			7,098		
1944							4,566	3,009			5,917		
1945	74	1,300	22	250	11,000	5,500	4,023	2,859	134/0		2,381		World War II ended
1946							5,348	3,492	36/0		2,002		
1947							3,815	2,548	30/0		2,871		*IAN* produced jute
1948							5,463	4,135	48/0		2,470		seed at Alenquer and
1949							9,707	4,924	75/0		3,877		Monte Alegre (-1965)
1950	74	1,300	22	250	23,000	25,000	9,328	5,254	126/0		5,489		
1951							14,534	8,664	111/0		11,281		
1952							18,089	4,920	112/6		11,428		
1953	74	2,000	37	350	55,000	60,000	13,403	7,264	96/58		16,304		Jap. immig. resumed
1954							16,127	7,139	48/8		13,904		
1955							14,484	9,930	30/22		17,526		
1956							20,006	11,659			18,583		
1957							22,111	10,818			17,173		
1958							22,222	9,018			15,811		
1959							23,484	8,800			12,980		
1960	70	2,500	25	400	43,000	75,000	28,773	10,118			9,767		
1961							37,202	11,017			11,674		
1962							33,902	13,575			11,432		
1963							33,245	10,877			11,883		
1964							37,565	13,670			11,939		
1965	60	3,000	20	500	120,000	130,000	47,687	13,898			14,249		
1966							31,501	12,956			13,034		***SUDAM*** founded
1967							12,741	26,867	737		29,952		

Table 3-5--continued

Yr.	*Kōtakusei* families	ha	Other Jap. families	ha	Brazilian families	ha	Jute Production (t) Amazonas	Pará	MA	Malva Production (t) Amazonas	Pará	MA	Related Events
1968							18,338	31,928	940		22,879		
1969							18,487	29,376	855		18,851		
1970	25	1,000	15	100	120,000	130,000	20,089	18,083			23,039		
1971							26,000	8,000		1,750	8,883	14,494	
1972							22,000	6,000		5,050	6,094	34,117	
1973							47,016	15,210		6,750	5,945	21,530	
1974							25,000	6,554		10,800	7,492	16,313	*IFIBRAM* founded *[4]
1975	10	800	10	300	80,000	75,000	24,000	6,738		12,000	7,398	3,938	
1976	7	500	10	200	90,000	100,000	28,000	10,764		17,000	30,161	4,765	
1977	7	700	8	100	90,000	100,000	25,200	9,822		19,800	28,856	4,200	
1978							10,000	6,954		25,000	28,413	4,490	
1979							19,484	9,021		22,021	22,195	4,736	
1980							18,874	8,806		19,410	24,729	5,024	
1981							22,296	16,590		25,309	29,410	2,622	
1982							10,327	3,843		19,502	20,045	2,270	
1983							7,800	5,119		18,734	19,563	2,854	
1984							10,100	8,991		19,484	27,951	2,449	
1985							15,700	4,381		19,610	14,423	2,195	
1986							20,000	7,857		11,709	21,548	2,804	
1987							11,911	7,576		17,204	28,772	2,427	
1988							10,894	5,160		30,346	26,923	2,300	
1989							7,115	1,213		8,540	10,000		
1990							2,820	830		7,004	3,862		
1991							1,618	1,685		4,070	5,627		
1992							1,559	1,685		7,927	7,614		
1993							1,971	1,699		5,761	5,192	576	
1994							2,111	193		14,137	1,831	240	
1995							1,901	234					

Sources: Jute cultivating family and area data are from Pará Kōtakukai (1990); Brazilian jute production data from Homma (1995) for 1937-51 and 1971-2, and Fundação Instituto Brasileiro de Geografia e Estatística (1952 to 1995) for 1952-70 and 1973-95; Brazilian malva production data from Homma (1995). ES=Espirito Santo, AP=Amapá, and MA=Maranhão. *[1] named 'Oyama Variety' by Tsukasa Uetsuka in 1936 *[2] Ryōta Oyama and Yoshimasa Nakauchi *[3] ***Companhia Industrial Amazonense S.A.*** *[4] Amazon Vegetal Fiber Production Promotion Institute = ***Instituto de Fomento à Produção de Fibras Vegetais da Amazônia***

South for the first time (Homma 1995), with gunny sack production in the Amazon and their distribution in southern states. Yet, according to Homma (1995), jute cultivation was always contingent upon both the availability of good floodplain soils, and more critically, sufficient fertile upland soils at Alenquer, Pará for seed production. Since the 1970s, the government tightened restrictions on forest conversion. In spite of this, large ranchers still rapidly expanded pastureland, thus relegating jute cultivation to a secondary land use (Homma 1995). Moreover, plastic sacks became popular in the 1960s (Tsuji 1994, Homma 1995). Various national projects on the upland (***terra firme***) since the 1970s dispersed the labor force of floodplain (***varzea***) dwellers (Homma 1995). Amazon jute production therefore declined precipitously after half a century of economic ascendency.

Japanese immigrant 'model jute farmers' left scattered along Amazon rivers generally did not return to their original settlements at Parintins. Some of them, including the Oyama Family, moved to the ***Zona Bragantina*** and became black pepper farmers. Others assisted in post-World War II Japanese immigration to the Amazon under Kotarō Tsuji, and later *Kaikyōren* and ***JAMIC*** (see Resumption of Japanese Immigration to the Amazon). Still others made fortunes through ***regatão*** river trading, owning businesses in the

cities. In the end, Tsukasa Uetsuka's dream of a model settlement based on sustainable agriculture was never realized. [Fujii 1955, Ikeda 1965, Tsunoda 1977, Yasui 1998]

Development of the Acará Settlement

The Japanese Plantation Company of Brazil Colonization Project, 1929-35

Early immigrants of the Japanese Plantation Company of Brazil Colonization Project began arriving in September of 1929, and were assigned to individual lots. While the Company was busily receiving and giving guidance to these new immigrants, the settlement itself was neither self-sufficient in rice nor vegetable production. Bananas and papayas were not yet mature. All groceries had to be purchased from Belém through the Company. Immigrants bought polished rice for 90,000 Réis (≈ US$ 9) per 60 kg bale, and then grew paddy for sale back to the Company for 8,000-9,000 Réis (≈ US$ 0.8-0.9) per bale. In comparison, soybeans were sold to immigrants for 12,000 Réis (≈ US$ 1.2) per bale. This price discrepancy occurred due to a sudden increase in a population that depended upon rice as a staple food and crop, where before it had been considered to be a side dish in the region. In addition, immigrants had to deliver 30 percent of their harvests to the company under a 70/30

sharecropping contract. [Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Mishō 1976, Han-Amazônia Nippaku Kyōkai 1994]

During the first three years, 61 of 202 families that came to Acará Settlement in 7 shiploads became settlement 'escapees' (*dakkōsha*). Among these escapees, 19 families remained in Pará (near Belém or the ***Zona Bragantina***), 6 families went to the Nordeste region, and 26 families moved to São Paulo and other southern states. Escapers preferred to farm independently outside of the settlement, rather than having their meager annual crop income exploited by the Company. This modified tenant system often caused dissatisfaction and migration among Japanese settlers in Brazil, reducing their motivation to work and appreciate the land. [Izumi and Saitō 1954, Ikushima 1959, Mishō 1976]

Saburō Chiba visited Brazil from May 1930 to February 1931, to see Japanese and American projects in the Amazon. He stayed in Acará Settlement for half a year. After discussions with farmers, he advised Fukuhara to give them land titles, leaving only their credit obligations with the company. Before the May 1931 rice harvest, immigrants raised a collective bargaining dispute (30 Percent Dispute or *Sanwari Sōgi*). They threatened to abandon their rice fields if the Company would not give up its share of the harvest. Fukuhara initially rejected this request, because of the company's financial difficulties caused by the Great

Depression. However, rebels among the Company's young employees that supported the immigrants applied sufficient pressure on the management. Land titles were rendered after payment by four installments, with a 6 percent annual rate of interest. A 25 ha lot having a house, a well and field (5-10 ha) prepared by the Company, was valued at 2,125,000-3,000,000 Réis (≈ US$ 230-320) for an immigrant through the seventh shipload (arriving in August 1931). For an immigrant from the eighth shipload (arriving in November 1931), a hectare of land was priced 40,000-60,000 Réis (≈ US$ 4-6) for a lot of no less than 25 ha. Payments were deferred for 2-3 years, and were to be made during the following 4 years with 6 percent annual interest. As a consequence, the Japanese Plantation Company of Brazil abolished 1) loans for living expenses, 2) free transport of products, and 3) free medicine for immigrants. Malaria treatment was later exempted from fees in 1932, due to its increase in the settlement. [Ikushima 1959, Mishō 1976, Chiba 1977]

The Japanese Plantation Company of Brazil selected cacao as the primary crop for Acará Settlement. This was Hachirō Fukuhara's idea. He had studied the US cacao market potential for chocolate. More than 232,000 trees had been planted by 1935, with half of these on company owned farms (Santa Maria, Boa Vista, Ipitinga, and Mariquita), and

another half on individual lots. The company's farms had a total area of 1,000 hectares. Here cacao trees were tended by ***'colono'*** immigrants, a new contract option that was first assigned to those arriving on the 8th immigrant shipload in January of 1932. Those who contracted to purchase land before leaving Japan, but who were short of money to gain immediate independence, were given the ***'colono'*** opportunity to work for company farms instead of depending on 'loans for living expenses.' Better-off independent farmers planted cacao trees on their own lots, and were remunerated for this by the company. [Ikushima 1959]

Trees grew well for the first three to four years, but started dying afterwards. This was attributed to: 1) poor soil on upland (***terra firme***) sites, in contrast to high flood plains having occasional floods every ten years (***varzea alto***), the original habitat of cacao in the Amazon; 2) lack of a shade-tree system; 3) little fertilization; and 4) rapid expansion of plantations without sufficient studies. To make up for the cacao losses, Fukuhara placed his final hopes on lead mining at the Xingu Concession contracted with Pará State in 1933. This turned out to be unsuccessful. [Izumi and Saitō 1954, Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Mishō 1976]

Meanwhile in Japan, Sanji Mutō, Fukuhara's most important supporter, died by assassination on March 10,

1934. Mutō had become the chief director (1932-34) of *Jiji Shinpō*, the newspaper founded by his respected college teacher, Yukichi Fukuzawa (1835-1901), in 1882. The paper accused a financiers' group led by Masanosuke Gō (the major financial backer of the Amazon Industry Corporation) of political scandal in January of 1934, that was suspected as the cause of Mutō's tragic end. The scandal precipitated the resignation en bloc of the Makoto Saitō cabinet in July of 1934 i.e., the Teijin Incident or *Teijin Jiken*). [Chiba 1977]

In 1935, the South America Development and Colonization Corporation in Tōkyō dispatched Mojūrō Iguchi to become manager of the Japanese Plantation Company of Brazil during its reconstruction. On April 3, 1935 Iguchi announced 1) personnel reductions, 2) closure of experiment stations and company farms at the Acará Settlement, Monte Alegre, and Castanhal, and 3) abolition of the ***'colono'*** system. Angry immigrants gathered at Hashizume Hall at Acará Settlement, demanding Fukuhara's resignation and compensation for themselves. Fukuhara surrendered ¥ 10,000 (US$ 2,857) of his own money, and was called back to Japan in despair. At this point, Acará Settlement had 2,862 ha of developed land, of which 2,555 hectares were farmlands owned by the Company and immigrants. Roads and buildings occupied the remaining 307 ha. Fukuhara, as the president, had invested ¥

2,450,000 (≈ US$ 830,500) in site construction and ¥ 1,250,000 (≈ US$ 423,700) as a working-capital fund for the Company. He had hoped to make Acará Settlement comparable to the Ford Concession (see Table 3-6). [Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Mishō 1976, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Han-Amazônia Nippaku Kyōkai 1994]

Table 3-6. Facilities of the Japanese Plantation Company of Brazil at Acará Settlement (ca. 1934)

Location	Facilities
Tomé-Açu Wharf	Company Office, Post Office & Wireless Station with Powerhouse, Central Hospital (13 buildings)*1, Commodity Supply Station, Ironworks, Sawmill, Wood Depositry & Pier, Rice Mill, Agricultural Storehouses (2 buildings), Gasoline Storage, Garage, Police Chief's Residence, Policeman's Residence, Guest House, Single Staff Dormitories (3 buildings), Single Employee*2 Dormitory, Staff *2Housing (7 buildings), Employee*2 Housing (6 buildings), Wells (7 locations), Cacao Processing Factory & Storage
Santa Maria Nursery	Slaughterhouse, Cowshed, Mechanic Housing (6 buildings), ***Colono****2 Housing (8 buildings), Laborer*2 Meeting House, Laborer*2 Sheds (13 buildings), Wells (3 locations)
Açaizal Experiment Station	Company Office, Sericulture Experiment Building, Pigpen, Pork Processing Factory, Compost Storages (2 buildings), Meteorological Station, Staff*2 Housing (2 buildings), ***Colono****2 Housing (10 buildings), Laborer*2 Shed, Wells (3 locations), Irrigation Pomp Shed
Boa Vista Company Farm	Staff*2 Housing, ***Colono****2 Housing (16 buildings + 4 tenements for 16 families), Laborer*2 Shed, Barn, Wells (4 locations)
Ipitinga Company Farm	***Colono****2 Housing (18 buildings)
Quatro Bocas (Jūjiro) Company Station	Company Office, Stand, Staff *2 Housing, Employee*2 Housing (2 buildings), Laborer*2 Shed
Agua Branca Company Station	Hashizume Hall, Sawmill, Agricultural Storehouse, Sugar Factory, Elementary School, Branch Hospital*1, Experimental Filature & Spinning/Weaving Factory, Well
Mariquita Company Station	Sericulture Experiment Station, ***Colono****2 Housing (5 buildings + 3 tenements for 12 families), Laborer*2 Shed, Wells (2 locations)
First Settlement*3	Clinic*1, Elementary School*4, Staff*2 Housing, Immigrant Housing (77 buildings), Wells (? locations)
Second Settlement*3	Clinic*1, Elementary School*4, Stand, Staff*2 Housing, Immigrant Quarters (4 buildings), Immigrant Housing (103 buildings), Wells (47 locations)
Transportation	Ships ('Antonina' 80 tons, and 'Tomé-Açu'), Trucks (some in the settlement), Cars (at company offices and hospitals)

Table 3-6--continued
Source: Ikushima (1959)
*[1] The hospital system hired 1 Brazilian and 2 Japanese physicians, 1 dentist, 3 nurses and 7 probationers.
*[2] The 'staff'were the white-collar workers of the company; 'employees' were immigrants (including all single young men) hired as blue-collar workers; ***'colonos'*** were immigrants hired at company-owned farms to make capital for their independence (during 1932-34 or applied to immigrants of 8th-17th shipments); 'laborers' were hired locally for tree felling and miscellaneous works.
*[3] The First Settlement (***Primeira Colônia*** = *Daiichi Shokuminchi*) included today's Boa Vista, Ipitinga, Mariquita and Arraia; and the Second Settlement (***Segunda Colônia*** = *Daini Shokuminchi*) included today's Agua Branca and Breu.
*[4] The school system had 4 Brazilian teachers invited from Belém (2 for each school), and a Japanese veteran principal for school management and moral education.

The Company decided to withdraw from the unprofitable colonization project, and to maintain only transportation, medical, and elementary schooling services. It concentrated its efforts on trade with Japan, exporting rubber latex, wood, leather, copaiba (*Copaifera* spp.) oil, cotton, corn, and carnauba (*Copernica cerifera*) wax. It imported bicycles, wire, and toys. The Company soon faced various restrictions, due to the commencement of World War II in 1938. [Izumi and Saitō 1954, Ikushima 1959, Mishō 1976, Han-Amazônia Nippaku Kyōkai 1994]

Agricultural cooperatives

Besides planting cacao trees, immigrant farmers also produced subsistence crops and products: upland rice, soybeans (*Glycine max*), cassava, corn, peanuts (*Arachis hypogaea*), cotton, castor beans (*Ricinus communis*), malva,

sisal, tobacco, sesame (*Sesamum indicum*), vegetables, silk worms, pigs, chickens and eggs. These products were sold to the Japanese Plantation Company of Brazil, or used for their own consumption. [Ikushima 1959, Mishō 1976]

In 1931, a group of farmers at Mariquita in Acará Settlement demanded that the company allow them to sell their vegetables independently in Belém. Horticulture was a common strategy of Japanese immigrants in South America to generate income quickly. Fukuhara decided to foster such economic independence, and suspended economically draining 'living expense loans' in May of 1931. Farmers organized the Acará Vegetable Producers Cooperative (*Acará Yasai Kumiai*) in April of 1931, under the direction of a president (*Kumiaichō*), Kōnosuke Takada (1890-1975), and treasurer (*Kaikei*), Toshio Sugae (1912-45) (term April 1931-November 1935). The membership fee was set at 1,000 Réis (≈ US$ 0.1; increasing to 2,000 Réis after the cooperative's second year). The produce handling fee was 15 percent of sale price. The Company subsidized the rent of the cooperative's store, which was located beneath Company headquarters in Belém. It also subsidized produce transportation costs from Acará Settlement on Company-owned trucks and a ship, the Antonina (80 t). [Izumi and Saitō 1954, Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Ikeda

1965, Mishō 1976, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

In those days, the residents of Belém, the largest city in northern Brazil, were less familiar with vegetable varieties than residents of small towns in the south of the country. Only collard greens (*Brassica oleracea* var. *acephala*), okra (*Hibiscus esculentus*), macacheira (*Manihot aypi*) and maxixe (*Cucumis anguria*) were seen in Belém's vegetable market. Farmers from Acará Settlement produced radish daikon (*Raphanus sativus*), tomatoes, green peppers (*Capsicum frutescens grossum*), eggplant (*Solanum melongena*), cucumbers (*Cucumis sativus*), green beans (*Phaseolus vulgaris*), cabbage (*Brassica oleracea* var. *capitata*), and oranges (*Citrus sinensis*). Tomatoes and eggplant were vulnerable to the endemic bacterial wilt, *Pseudomonas solanacearum*, and fruited well only in newly opened and well-burned fields. Farmers later learned to utilize local weeds such as jua (*Solanum toxicarium*), jurubeba (*Solanum grandiflorum*), and jurubebínia (*Solanum paniculatum*) as rootstock to control this wilt (Kitagawa 1994). Cabbage had not been expected to grow in the Amazon previously, and was shipped from southern Brazil only for Belém's wealthiest people. Mataichi Kinoshita (1896-1965), the leader of the Second Settlement of the Acará Settlement, succeeded in

getting cabbages to head up in 1932. [Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Mishō 1976]

The first task of Tatsunosuke Murakami, who was in charge of vegetable sales (*Hanbai-gakari*) in Belém, was to tell customers how to eat vegetables. In the spirit of traditional peddlers in Japan, he hired up to 20 locals to hawk vegetables in baskets hung from shoulder poles. Mitsuyo Maeda and his wife Daisy May Iris, an English nurse, helped the farmers in their marketing by inviting influential people to try various kinds of vegetable dishes at home. Belém's physicians also promoted adding vegetables to local diets. The farmers soon realized that product grading would not help in such an underdeveloped market, where consumer preference was for the lowest unit price, such as less costly finger-tip size tomatoes rather than valuable larger ones. They had no alternative but to produce a greater quantity of vegetables at lower unit cost, even though a lot of product had to be occasionally discarded into the river. For example, Izumi and Saitō (1954), and Gamō (1957) still observed extensively planted swidden-farm tomatoes at Acará Settlement (then Tomé-Açu), which did not have supports and crawled on the ground. Thus, the 'flooding vegetables' from Acará Settlement improved local diets, while the Japanese came to be called '***nabo***' (radish), instead of '***japonês***.' [Tomé-Açu Sangyō

Kumiai 1955, Ikushima 1959, Mishō 1976, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

After the downsizing of the Japanese Plantation Company of Brazil in April of 1935, its manager, Mojurō Iguchi, adopted a policy to encourage the financial independence of immigrants who would otherwise become a burden to the Company. The rudimentary Acará Vegetable Producers Coop was therefore reorganized into the Acará Production Union (*Acará Sangyō Kumiai*) on November 19, 1935. It was modeled after the multipurpose agricultural cooperatives organized under Japanese Production Union Law (*Sangyō Kumiai Hō*) of 1900. Kōnosuke Takada (1890-1975) became chairman of the Union's board (*rijichō*), Yatarō Sawada (1890-1937) was director in charge of collective purchases (*kōbaibu-riji*), while there were seven other newly selected board members (*riji*), with terms from November 1935 to April 1936. The board was reelected the following year, with Kōki Maru (1878-1952) becoming chairman, and Tomoji Katō (1898-1956) becoming managing director (*senmu-riji*). Four more board members were added, having terms from April 1936 to April 1937. [Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Ikeda 1965, Mishō 1976, Han-Amazônia Nippaku Kyōkai 1994]

The new cooperative Union began marketing rice, the primary product of Acará Settlement. The sale of rice had previously been handled solely by the company. Joint

purchasing of commodities was accomplished using ships returning from Belém markets. The Company financed construction of a Union rice mill, and provided free transportation for the Union's business activities. Almost all immigrant families joined, represented by heads of households. Union membership increased from 89 in 1935, to 102 in 1936, and then to 140 in 1937, when immigration ended. [Izumi and Saitō 1954, Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Ikeda 1965, Mishō 1976]

In 1936 malignant malaria broke out, accompanied by the fatal black water (hemoglobinuric) fever. Acará Settlement became known as the settlement of 'deadly poisonous malaria' and 'hell on earth,' where the vital index (births/deaths x 100) went down to 107 in 1936, never to exceed 200 from 1931 to 1939. Shaken settlers retreated to ownerless forests, even 10-20km away from the settlement (when carriage was the only transportation means), to practice 'plundage farming' (*ryakudatsunō*). They slashed and burnt trees as much as possible to plant rice and vegetables for quick money to help themselves escape to the vicinity of Belém or southern Brazil. These new swiddens produced up to 40 bales, or 2.4 tons of paddy per hectare. Although less productive than this, former Company cacao plantations were opened for less labor-intensive annual cropping. Ironically, the polished São Paulo variety rice of Acará Settlement was highly

appreciated at Belém and Manaus grain markets as 'Acará Rice.' It was registered as the first class 'Monte Fuji' rice in Rio de Janeiro. Paddy production of the settlement surpassed 30,000 bales, or 1,800 tons over a total area of 1,300 ha. Farmers who decided to escape from the settlement reduced their diets and worked hard to save all the money they could, then moved out of the area during the dry season after the harvest (June-December). This became known as 'withdrawal-from-lot (*taikō*) season,' and was repeated annually until 1939. [Izumi and Saitō 1954, Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Ikeda 1965]

Management of the cooperative Union under these unstable conditions was handled by a reduced board, with Hajime Tsuchiya (1887-1954) as chairman, and Tomoji Katō (1898-1956) as managing director (terms: April 1937-April? 1939). At this point, the majority of people joined the Union not for their agricultural establishment and independence at the settlement, but by selling products with slightly better prices to the Union than to the Company in order to generate cash for resettling elsewhere. In 1938, Acará Settlement had a total production income of 456,154,000 Réis, of which 60.5 percent was derived from rice, 20.5 percent was from vegetables, 11.2 percent wasv from wood, 2.8 percent was from livestock, 1.9 percent was from cotton, 1.8 percent was from urucu (*Bixa orellana*)

seeds, 0.2 percent was from black pepper, 0.1 percent was from cassava flour, and 1.1 percent was derived from other products. Union members totalled 74 in 1938, or half that of the previous year. Members together sold products worth 203,010,000 Réis (≈ US$ 11,600 or 44.5 percent of the Acará Settlement's production), and jointly purchased items worth 59,999,000 Réis (≈ US$ 3,400). The number of Union associates continued to fall, hitting bottom at 50 heads-of-households in 1939. Only families that had many debts, that had many women and children, and/or had many non-productive workers remained in the settlement, while others evacuated. That same year World War II broke out, and Tomoji Katō (1898-1956) was elected chairman of the Union, Enji Saitō (1891-1958) was elected managing director, and Sōichirō Kimura (1905-63) became treasurer (terms: April? 1939-April 1946). This board, headed by two ricemill owners who pioneered black pepper production in the area, led the helpless farming families through the bleak war period. From 1940-1949, the Union membership hovered at 53-57 heads of households, or only 15-16 percent of all 352 families that had originally come to Acará Settlement. [Izumi and Saitō 1954, Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959]

<u>Black pepper</u>

In 1930, a Japanese authority of tropical agriculture named Saburō Takagi arrived to become general manager of the

Acará Settlement. He recommended the adoption of black pepper as a minor crop by immigrant farmers, recommending the planting of 200-300 plants by each family. He knew of this species, as it was cultivated by Chinese in Southeast Asia. The plants' intensive care and advanced management requirements seemed suitable for Japanese farmers. A valuable agricultural product, relative to its weight, was good news for an interior settlement with handicapped transportation. Jūichi Ikushima was ordered to search for a local pepper variety, one which Fukuhara had witnessed during his first mission to Brazil in 1926. Ikushima found and purchased the plant, creeping on inga (*Inga marginata*) trees and coconut (*Cocos nucifera*) palms in farmyards at both Americano (a hamlet along the old Bragança Railway) and Irituia. He brought the specimens to Castanhal Farm, where Haruyoshi Kataoka was trained in its cultivation and fruit processing techniques. This was probably the Chinese method of using hardwood stakes as supports, which Ikushima learned in Southeast Asia before coming to Brazil. The stakes might be 3-3.2 m long, and buried about 50 cm in the soil. Black pepper vines attached to the stake formed cylindrical bushes as commonly seen in Brazil today. About 300 rooted cuttings were planted at Castanhal Farm, while 2,000 more were sent to the Açaizal Experiment Station at Acará Settlement. Some of the plants were distributed to interested people

participating in experimental cropping. Hajime Tsuchiya (1887-1954), the third chairman of Acará Production Union, was recorded to have eagerly planted black pepper as a component of his diversified agricultural homestead. However, this local black pepper variety demonstrated irregular cycles of flowering and fruiting, and only produced 500 g of dry fruit per mature plant, much less than the expectation of 2-3 kg. [Ikushima 1959, Nagao 1965, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Han Amazônia Nippaku Kyōkai 1994]

Fukuhara consulted Gorō Yoshida, an authority on tropical plant taxonomy and a resident representative of the Japanese Ministry of Colonization in Belém. It was noticed that the local black pepper variety, presumably introduced from Africa by slaves or from Cayenne, French Guiana by Jesuits, had already degenerated. Yoshida ordered his subordinates in Singapore, Rikita Sakai and Zenshō Teruya, to search for alternative varieties. They obtained a Kuching variety in Peninsular Malaysia, and passed 20 cuttings on to Makinosuke Usui (1894-1993), an immigrant shipping director who had stopped over in Singapore during May of 1933 for the burial of an old woman who died on her journey. The South America Development and Colonization Corporation in Tōkyō had entrusted Usui with ¥ 100 (US$ 25) for Sakai and Teruya, to pay for this black pepper

contraband from the British colony. Usui pretended that he had casually purchased the cuttings from a peddler at a Singapore park. In doing this he would become 'the savior' of Acará Settlement among immigrant farmers there. The new black pepper variety became known as 'Singapore' (***Singapura***) in Brazil. The cuttings were received in Belém by Kōzō Yoshida, the last chief of the Açaizal Experiment Station, and arrived at Acará Settlement on July 10, 1933. Only two or three individuals produced buds. These had been propagated into 30 plants by April of 1935, when the station was closed. However, due to depressed black pepper prices (8,000-10,000 Réis/kg ≈ US$ 0.5-0.6/kg), and the impoverished conditions at Acará Settlement, most people did not pay any attention to those plants. Yoshida left with some of the original cuttings for Registro, São Paulo. That area would later became the black pepper production center of the south. [Izumi and Saitō 1954, Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Nagao 1965, Ikeda 1965, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Han Amazônia Nippaku Kyōkai 1994]

Tomoji Katō (1898-1956) was a relatively well-off immigrant farmer who had been entrusted with the Company's Ipitinga Rice Mill at the Acará Settlement. He was a '*tokunō*' or devoted and research-minded agriculturist, and keenly interested in the new variety carried all the way

from Singapore. Seeing that the closed experiment station would soon be overgrown by secondary forest growth, Katō paid Fukutarō Obana 70,000 Réis (≈ US$ 4.4) for each of three black pepper saplings. Obana was charged with watching the closed experiment station. However, these plants died when Katō fell ill with malaria and the black water fever. Having scarcely survived, Katō purchased more saplings, of which only two took root. He propagated them and gave some plants to Enji Saitō (1891-1958), an immigrant farmer who had been entrusted with the Company's Arraia Rice Mill at the Acará Settlement. They together learned how to propagate, tend, harvest, and process black pepper. Their greatest concern was the need for shade trees, which had been a key factor in the unsuccessful result of the Company's cacao plantations. Saitō, however, demonstrated better growth of the Singapore black pepper variety in his non-shaded lots, and this would determine the standard style of black pepper cultivation in the Amazon. [Izumi and Saitō 1954, Fujii 1955, Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959]

The import of black pepper to Brazil became uncertain after 1939 due to World War II, and completely halted when the Japanese occupied Southeast Asia in 1941. The price of black pepper shot up to 30,000 Réis (≈ US$ 1.4) per kilogram. The farmers of Acará Settlement remembered their

abandoned local variety of black pepper, and quickly turned to the Singapore variety of Katō and Saitō. In 1946, black pepper's price rose to Cr$ (Cruzeiros) 85 (≈ US$ 5.2) per kilogram, or 10 times its price before the war. This was caused by the decline of Chinese black pepper plantation production in Southeast Asia, at the time of the wars of independence there. [Izumi and Saitō 1954, Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Nagao 1965, Ikeda 1965, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

Japanese Immigrants During and After World War II (with Focus on Acará = Tomé-Açu Settlement)

'The POW Period'

In accordance with the resolution of the Pan-American Foreign Ministers' Conference held in Rio de Janeiro, January 15-27, 1942, Brazil severed relations with Japan on January 29, 1942. The US had started construction of an air base near Belém, Pará during the previous year. Gatherings of more than three Japanese people and use of the Japanese language in public were forbidden. All sheds in the Acará Settlement were searched by the Brazilian military police, during which Japanese-written documents were confiscated. Relocation of Japanese immigrants started in São Paulo on February 2, 1942. Freezing of all Axis assets was decreed on February 11, 1942. The business license of the Japanese

Plantation Company of Brazil was repealed on April 17, 1942. The company was ordered to be liquidated by the government, and all of its vested business interests were canceled. The company's headquarters was commandeered by the military, and forced to move to the company's immigrant hostel. As this was soon requisitioned to accommodate Brazilian immigrants from the Nordeste Region, the company moved again, to 90 Avenida Gaspar Viana. Company manager Mojurō Iguchi left Brazil in the company of Japanese officials on July 3, 1942, aboard the first diplomatic exchange ship from Rio de Janeiro. When all company staff had been repatriated, only Renkichi Hiraga was left to take care of final liquidation. Japanese immigrants considered themselves to be 'deserted people' (*kimin*). [Fujii 1955, Tomé-Açu Sangyō Kumiai 1955, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, São Paulo Jinmon Kagaku Kenkyūjo 1996]

On August 18, 1942 a politically agitated riot started in Belém, triggered by the alledged sinking of a Lloyd Brasileiro ship by a German submarine near Belém. Those associated with Axis Alliance nations, especially easily identifiable Japanese in the vicinity of Belém, were plundered by the mob and their assets set afire. The headquarters of the Japanese Plantation Company of Brazil, the Acará Production Union's vegetable store, and the branch office of the Amazon Industry Corporation were all

destroyed. The Acará Settlement and the ships Antonina and Tomé-Açu were attached to the Pará State government, and the pier and warehouses of the Japanese Plantation Company of Brazil in Belém were seized by the Bank of Brazil (***Banco do Brasil***). The Acará Settlement, its name now changed to Tomé-Açu State Settlement (***CETA*** [***Colônia Estadual de Tomé-Açu***]), was designated the relocation camp of Axis Alliance nationals in the Amazon. [Izumi and Saitō 1954, Fujii 1955, Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Tsunoda 1977, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, São Paulo Jinmon Kagaku Kenkyūjo 1996, Yasui 1998]

When World War II started about 70 Japanese families resided near Belém, most of whom were 'escapers' from interior settlements. Half of these people were horticulturists, organized into the Belém Vegetable Producers' Cooperative (*Belém Yasai Kumiai*) that had been established in July of 1938. This cooperative and Acará Production Union (*Acará Sangyō Kumiai*) had been responsible for the supply of vegetables to the state capital. While some of these suburban producers were protected by local Brazilian leaders, most were forced to abandon their fields when they were assaulted. They sought security in local jails. Police shipped them to the isolated ***CETA*** camp in the forest, along with some Germans and Italians. According to Kikuchi (1954), Renkichi Hiraga, who was appointed ***CETA***

manager during 1944, recorded that 126 Japanese families (617 people), 117 Brazilian families (283 people), 13 German families (27 people) and 1 Italian family (4 people) were residing there at the end of 1944. Some directors of the Amazon Industry Corporation were among those interned, having been convoyed there from Vila Amazônia, Parintins, Amazonas. [Izumi and Saitō 1954, Fujii 1955, Tomé-Açu Sangyō Kumiai 1955, Tsunoda 1977, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Yasui 1998]

The farmers from Acará Settlement felt themselves to be prisoners of war (POWs), as all community services formerly provided through the Japanese Plantation Company of Brazil were replaced and controlled by ***CETA*** officials sent from Belém. The Acará Production Union functioned only to receive produce and distribute commodities. The ***CETA*** officials' inefficient bureaucracy hindered farmers' activities through untimely shipments of perishables and expensive handling fees. Nevertheless, their daily lives were otherwise tranquil, with no compulsory labor or relocation to Japanese concentration camps in Texas, USA, as had happened to ethnic Japanese from Peru and 12 other South and Central American countries (Paulista Shinbun 1996). [Izumi and Saitō 1954, Tomé-Açu Sangyō Kumiai 1955, Ikushima 1959, Staniford 1973, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

The farmers could not immediately perceive that they would in some ways benefit from this situation. First, young people who had gained experience out in Brazilian society, as well as learning fluent Portuguese, were forced back to this settlement. They would become post-war leaders of the Japanese community at Tomé-Açu and its cooperative (Staniford 1973). Second, an agreement was made in 1943 between US medical officers in Belém and Renkichi Hiraga, regarding Japanese at ***CETA*** camp who volunteered for human testing of the drug camoquine. US soldiers were suffering from malaria on the Pacific front. The camoquine experiment was successful, in part because of the exactness with which subjects took their prescriptions. US forces supplied abundant medicines to the ***CETA*** camp even after the test had ended. The US also assumed responsibility for sanitation improvements in the Amazon, in exchange for rubber price controls there, since Southeast Asian rubber supplies were under Japanese control. [Fujii 1955, Tsunoda 1966 and 1988, Ikegami 1985]

Third, but not least, the Japanese expansion and retreat in Southeast Asia created a political vacuum that led to the independence wars after World War II. The Dutch East Indies had been the dominant global source of black pepper before these events. However, local Chinese black pepper farms declined due to the oppression of Japanese

occupation forces and newly independent Indonesians. The latter converted these farms to rice fields for domestic food needs. In the fiscal year 1938-39, the world market received 93,000 tons (t) of black pepper, of which the Dutch East Indies produced 62,000 t, and British India contributed 18,500 t. In 1951-52, the global market saw only 43,000 t, of which Indonesia contributed 10,000 t, and India 21,500 t. The black pepper price in New York jumped from US$ 90/t in 1940 to US$ 3,580/t in 1950 (Wakatsuki 1973). The 'deserted' Japanese in the Amazon, who played no part in the war, but merely survived in a far away tropical rainforest, were well-positioned to benefit from this market opportunity. [Izumi and Saitō 1954, Ikushima 1959, Tomé-Açu Sangyō Kumiai 1961a]

Post-War Reconstruction of the Acará Settlement

News of the US occupation of Japan was a shock to the immigrants. Most of them could not immediately believe that their homeland had 'vanished' from the world map. As time passed, they became aware of the post-war confusion within Japan and decided to stay for life in their adopted country (*yōkoku*). Brazil had become the motherland (*bokoku*) of their children, and the place where they finally attained an appropriate crop (*tekisei sakumotsu*). However, their cooperative Union was still under the control of ***CETA***

officials. In addition to chronic delays in shipping produce and doing business transactions, officials were enjoying personal monetary benefits from their official posts. They usually paid 10,000-20,000 Réis (≈ US$ 0.5-1.0) less per kilogram of black pepper to farmer producers than the market price in Belém. The Union's directors were politically weakened by the defeat of Japan, and compelled to yield to haughty low-ranking officials. Moreover, the farmers had no experience in negotiating with the state government, since this had previously been the role of the Japanese Plantation Company of Brazil. The young people who had returned to the settlement during the war became irritated with the irresolute attitude of their elders. A group of 17 young people in their 20s and 30s organized the Acará Farmers' Fellowship Association (*Acará Nōmin Dōshikai*). They submitted a cooperative reform proposal to the Union management on April 7, 1946, which would underpin the future prosperity of the settlement. [Izumi and Saitō 1954, Fujii 1955, Ikushima 1959, Tomé-Açu Sangyō Kumiai 1961a, Staniford 1973, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

> To Acará Production Union April 7, 1946
>
> We were advised of your readiness for a drastic reform of the Union management, and as your companions concerned with our common future and that of the settlement, were asked to submit a proposal for reform. We have listed items that would require emergency

measures. We would appreciate your wisest desicions and quickest executions.

Proposals
1. Interior Issues
We should abandon unfavorable old habits and renew our minds by improving the Union organization. The old and young should actively work together to overcome our difficulties.
a. Admit all willing Japanese immigrants at the Acará Settlement to the Union.
b. Improve Union financing for the benefit of its members.
c. Improve the Union finances by separating collective sale and collective purchase divisions.
2. Exterior Issues
Our future course could be charted by our efforts alone. We should actively negotiate with all concerned parties.
a. Actively negotiate with the Tomé-Acu State Settlement (***CETA***) officials.
b. Improve the methods of collective sales and purchases.
c. Establish our exclusive transportation facilities.
We Acará Farmers' Fellowship Association are ready to dedicate ourselves to the reforms proposed above. Here we list our goal and course of action for the understanding of all Union members.

Goal
As the World War has ended, we Japanese immigrants at the Acará Settlement should finally become independent. The power and money of our homeland should not be anticipated for several, or teens, or even several decades of years. Our future course should be charted by our own efforts. We are convinced that we young people who understand Portuguese sufficiently and suitably to face the challenges of Brazilian society, must contribute to this goal. Thinking of Acará Settlement on this occasion, we believe that past miscellaneous ill feelings among ourselves should be cleared up and our minds must be renewed. We should abandon selfishness and dedicate ourselves to the public welfare with a spirit of mutual help. To make this settlement our second home we struggled for more than 15 years, to become a perpetually peaceful society. If we cannot improve our well-being through a new idea, we will become slaves of capitalists, following the examples of the Brazilian interior. And

our descendants will never be benefitted by civilization, remaining so-called '***caboclos***.' We are determined to realize our new ideal society the soonest possible, by overcoming difficulties through our unity and our vigorous effort.

Course of Action
We will establish a public organization and act in every field for the development of Acará Settlement; i.e. the Union reforms, agricultural studies, economic development, sanitation, road maintenance, etc.

Acará Farmers' Fellowship Association

[Izumi and Saitō 1954]

The chairman of Acará Farmers' Fellowship Association, Shirō Toda (1912-) was invited to the Union directors' meeting on April 12, 1946, and explained their proposal. The cooperative called an extraordinary general meeting on April 20, 1946, and resolved to add one more director to the board. Tomoji Katō resigned as chairman, and Shirō Toda entered the new board representing Acará Farmers' Fellowship Association. By a mutual vote of the four elected members, Enji Saitō became chairman (*rijichō*), Shirō Toda became managing director (*senmu-riji*) in charge of marketing in Belém, and Sōichirō Kimura and Mamoru Kisaki became executive directors (*jōmu-riji*) coordinating farmers at the settlement (terms: April 1946-September 1946). The new board offered its cash reserves to the members to increase black pepper production. [Tomé-Açu Sangyō Kumiai 1961a]

Acará Farmers' Fellowship Association immediately undertook two challenging projects. The first was to build

a boat for their own means of product transportation, since all boats of the former Japanese Plantation Company of Brazil had been seized by the state government, and the Union did not have the resources to buy one. The second was to recover commercial transaction rights for individual farmers. On June 30, 1946 interested farmers held a rally to discuss their current situation, and resolved to create a registered cooperative, which could freely sell products and purchase commodities without the intervention of the ***CETA*** officials. The farmers appreciated the initiative of Acará Farmers' Fellowship Association. On September 12, 1946 the Union's board members were reelected. Enji Saitō resigned, Shirō Toda assumed as chairman and managing director, and Sōichirō Kimura became executive director. The 6 other directors included 4 members of Acará Farmers' Fellowship Association (terms: September 1946-July 1947). The settlement leadership of old rice-mill owners was replaced by the young farmers. [Izumi and Saitō 1954, Tomé-Açu Sangyō Kumiai 1961a, Tsunoda 1966 and 1988, Staniford 1973]

The boat building project faced heavy obstacles, as no one really had boat-building experience. A carpenter named Keishi Nagano (1920-65) became the master builder, and an automobile mechanic named Katsumasa Takahashi drew up plans. Members volunteered day and night for boat construction duty, sacrificing their farms and becoming thinner every

day. Building materials cost three times more than expected (30,000,000 Réis ≈ US$ 1,600). This sum was financed by a Brazilian in Belém. Four months overdue, it took seven months to complete this rough-built boat, with its high center of gravity. The screw propeller was attached to an old rebuilt truck engine, which had been abandoned at the settlement long before. On November 18, 1946, the ***'Universal'*** (18 t) was launched. It managed to reach Belém having 17 breakdowns and repairs on its way downriver. Meanwhile, fluent Portuguese speakers Katsumasa Takahashi and Satoshi Sawada (1919-) persistently negotiated with the government of Pará State for recognition of transaction rights. After many twists and turns, due to the vested interests of ***CETA*** officials, the issue was finally resolved at the end of 1946. From that time the Union was charged with collective marketing and purchasing activities, while the Acará Farmers' Fellowship Association handled transportation. [Izumi and Saitō 1954, Fujii 1955, Ikushima 1959, Tomé-Açu Sangyō Kumiai 1961a, Tsunoda 1966 and 1988, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

In 1947, the Union board was reelected in order to prepare for its incorporation. Renkichi Hiraga (1902-85) became chairman (***diretor-presidente*** = *rijichō*), Shirō Toda bacame managing director (***diretor-gerente*** = *senmu-riji*), Satoshi Sawada became secretary (***diretor-secretário*** =

shōgai-riji) in charge of public relations, tax and transportation (these three were stationed in Belém), and Sōichirō Kimura became executive director (***diretor-executivo*** = *jōmu-riji*). The six other directors included four members of the Acará Farmers' Fellowship Association (terms: July 1947-April 1957). On September 30, 1949 the Tomé-Açu Multi-purpose Agricultural Cooperative (***CAMTA*** [***Cooperativa Agrícola Mista de Tomé-Açu***] = *Tomé-Açu Kongō Nōgyō Sangyō Kumiai*, changed to *Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai* in 1978) was registered. Acará Farmers' Fellowship Association donated its boat and a truck to the Cooperative and disbanded that same year. [Izumi and Saitō 1954, Fujii 1955, Ikushima 1959, Tomé-Açu Sangyō Kumiai 1961a, Staniford 1973, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

Resumption of Japanese Immigration to the Amazon

While the settlement once called 'Hell on Earth' was finally experiencing a little hope for the future, Japan was mired in the purgatorial mess that succeeded armistice on August 15, 1945. About 2,100,000 Japanese died in World War II, while 10,000,000 lost their homes to bombing. Japan's land area was reduced to half its pre-war extent, and had to accommodate a total of 6,249,000 repatriates, including soldiers and immigrants. In the domestic job market, 7,200,000 former soldiers and 3,100,000 repatriated

immigrants searched for a means of survival. By the end of 1945, there were estimated to be more than 13,000,000 jobless people. Even for those fortunate to have work, real wages at that time dropped to less than 30 percent of 1934-36 levels, due to inflation. Rice production in 1945 was 6,000,000 t, or only 65 percent of 1933-35 production. Even worse, the 20 percent of domestic consumption imported from Korea and Taiwan before the War was now unavailable. In October of 1945 the price of rice on the black market was 132 times above its official price. Engel's coefficient (food & drink expense/living expense x 100) was 72.2 in 1946, in contrast with 40 during 1934-36. Yet the population still increased, and subsequent baby boom of 1947-49 added more than 6,000,000 newborns. On May 13, 1949 the House of Representatives unanimously approved a resolution concerning Japan's domestic overpopulation ('*Jinkō Mondai ni Kansuru Ketsugi*'). The resolution stressed 1) industrial development, 2) birth control, and 3) preparations for future emigration. The latter referred to the hope that the world community would again accept Japanese immigrants, who had now mastered democracy, and would contribute to world peace and welfare with their thankful minds. However, General Headquarters of the Allied Powers, which according to the terms of the San Francisco Peace Treaty governed Japan until April 28, 1952, did not

allow emigration. They were still afraid of the 'modified invasion' by sending out Japanese immigrants overseas. [Wakatsuki 1973, Kuroda 1987]

Meanwhile in Brazil, Getúlio D. Vargas (1883-1954) was attempting to return to the country's presidency. In 1950, he canvassed at Santarém, Pará, and pledged to the audience at the Cathedral Plaza that he would protect the jute industry and establish a jute processing factory there if he was elected. Kotarō Tsuji (1905-70), who was by then a jute producer and broker in Santarém was in the audience. Tsuji entrusted a letter to President Vargas with his friend Elías Pinto, the Santarém branch head of the Brazilian Laborer Party (***Partido Trabalhista Brasileiro***), who attended Vargas' inaugural on February 1, 1951. Tsuji wrote that he was the Japanese who had explained about jute to Vargas at Parintins in 1940. He petitioned for the liberation of the frozen 700,000,000 Réis (≈ US$ 37,000) of the liquidated Amazon Industry Corporation to provide investment funds for the jute factory that Vargas pledged. Vargas called Tsuji to Petrópolis, Rio de Janeiro, on March 3, 1951, and asked him to undertake the construction of a jute factory. At this meeting, Tsuji asked the president about his impression of Japanese immigrants. Receiving a positive answer, Tsuji wrote home to request that Tsukasa Uetsuka (1890-1978) make an official visit to Brazil for negotiations about

resumption of Japanese immigration. [Fujii 1955, Kokusai Kyōryoku Jigyōdan 1988b, Han-Amazônia Nippaku Kyōkai 1994]

Prime Minister Shigeru Yoshida (1878-1967; term 1946-54) liked this idea, but could not authorize it due to the critical international scrutiny Japan was then receiving. Uetsuka came to Brazil as a private individual in August of 1951, to have meetings with Pará and Amazonas state officials and *Kōtakusei*. Impressed by the eagerness of all parties concerned about new Japanese agricultural immigrants, Uetsuka and Tsuji prepared a plan to introduce 5,000 families (about 25,000 people) to the Amazon over five years, beginning in 1952. These immigrants would help increase jute production by 15,000 t to meet Brazil's domestic consumption needs. The two met with President Vargas on September 22, 1951, and this plan was eventually approved by the National Council of Immigration and Colonization (***Conselho Nacional de Imigração e Colonização***) on August 18, 1952. Meanwhile, Vargas provided his '***amigo***' Yasutarō Matsubara (1892-1961) with a military airplane to search for potential settlement sites for 4,000 Japanese families in the interiors of Maranhão, Bahia, Minas Gerais and Mato Grosso States. This immigration plan was also approved by the relevant authority in August 1952, just after approval of Tsuji's plan. President Vargas sent a message to the congress on March 15, 1953, referring to the

ability of Japanese to adapt to unhealthy, tropical lands that were eschewed by Europeans, such as the Amazon. He also mentioned Japanese contributions to the Brazilian economy, especially the jute industry. This caused the government to reconsider its restrictive policies, though the public still expressed strong resentment of Japanese immigrants due to their post-war turmoils (see Chapter 2). [Fujii 1955, Wakatsuki 1973, Kokusai Kyōryoku Jigyōdan 1988b, Han-Amazônia Nippaku Kyōkai 1994]

Vargas was the first Brazilian president to visit the Amazon, in October 1940 (Hecht and Cockburn 1989, Nishizawa and Koike 1992). Vargas addressed in Manaus that:

> "The Amazon, under the impact of our will and our labor, shall cease to be a simple chapter in the history of the world and, made equivalent to other great rivers, shall become a chapter in the history of civilization." [Hecht and Cockburn 1989]

In 1953, Vargas laid the groundwork for interior development by creating the Legal Amazon (***Amazônia Legal***) and the Superintendency for Economic Valorization Plan of the Amazon (***SPVEA*** [***Superintendência do Plano de Valorização Econômica da Amazônia***]), the predecessor of the Superintendency for the Development of the Amazon (***SUDAM*** [***Superintendência do Desenvolvimento da Amazônia***]) (Hecht and Cockburn 1989, Nishizawa and Koike 1992). He resolved to satisfy both Brazilians and Japanese by letting the latter cooperate in his national integration policy through rural development.

This decision was codified by Francisco Toledo Piza, the first president (term June-July 1954) of the National Institute of Immigration and Colonization (***INIC*** [***Instituto Nacional de Imigração e Colonização***]), the predecessor of the National Institute of Colonization and Agrarian Reform (***INCRA*** [***Instituto Nacional de Colonização e Reforma Agrária***]). Japanese called this the 'July 1 Agreements' (*Nana-Ichi Torikime*). These were the only officially signed documents that legitimized Tsuji & Matsubara Quota. Piza was close to Japanese farmers, having held presidential posts of Japanese-founded agricultural cooperative unions in São Paulo. Soon after these events, however, he was switched to the managing directorship of the Bank of Brazil Rural Finance Commision (***Comissão de Financiamento Rural do Banco do Brasil***), the organ for financing ***INIC***. The Comission was abolished in the wake of Vargas' suicide on August 24, 1954. [Fujii 1955, Kokusai Kyōryoku Jigyōdan 1988b, Brazil Nihon Imin Hachijūnenshi Hensan Iinkai 1991, Comissão de Elaboração da História dos 80 Anos da Imigração Japonesa no Brasil 1992]

The first 17 families (54 people) of 'jute immigrants' arrived in Belém on March 7, 1953. They soon provoked the criticism of concerned Brazilian and Japanese officials, due to the immediate fleeing of some families that became frightened by the extraordinary Amazon River flooding that

year. After this event the 'Tsuji Quota' of 5,000 families was allocated to other agricultural immigrants. Most of these were sent to federal and state interior settlements that had been established to provide food to the Amazon's major cities (see Tables 3-7 and 3-8, and Figures 3-1 and 3-2). In 1954, Tsuji organized in Belém the Amazon Economic Development Corporation (*Amazônia Keizai Kaihatsu Kabushiki Gaisha;* taken over by the Federation of Overseas Associations of Japan Belém Branch in 1956), enlisting the services of former *Kōtakusei* to receive new immigrants. However, many of these 'planned' immigrations did not produce satisfactory results. First of all, infrastructural development of remote settlements included in the desk plans of Brazilian federal and state officials were not realized as soon and efficiently as planned. Coordination between Brazilian and Japanese officials was not effective enough to supply necessary assistance to the immigrants. [Wakatsuki 1973, Han-Amazônia Nippaku Kyōkai 1994]

From December of 1954 until April of 1955 a total of 785 people (122 families) were settled on the rubber plantations of Fordlândia and Belterra (both part of the former Ford Concession). These sites were then managed by the Northern Agronomic Institute (***IAN*** [***Instituto Agronômico do Norte***], today's ***CPATU***). This was accomplished through an agreement between ***IAN*** and Kotarō Tsuji, with the permission

Table 3-7. Japanese immigration to the Brazilian Amazon (1907-58)
Be=Belém & vicinity, Br=Bragança Railway, Gu=Guamá, Ta=Tomé-Açu, Mo=Monte Alegre, Sa=Santarém, Fo=Belterra & Fordlândia, AP=Amapá, Ju=Jute Zone, Mé=Maués, Ma=Manaus & vicinity, Bv=Bela Vista, AC=Acre, RO=Rondônia, RR=Roraima

Year	Be	Br*1	Gu	Ta*2	Mo	Sa	Fo*3	AP	Ju	Mé	Ma	Bv	AC	RO	RR	Total
-1928	124									12			12			148
1929	10			558						50						618
1930	12			395	30				25	66						528
1931	39			310					47	11						407
1932	8			239					70	52						369
1933	20			324					84							428
1934	15			195					70							280
1935	26			64					59							149
1936	8			70					51							129
1937	7								4							11
Pre-war	*269*	*0*	*0*	*2,155*	*30*	*0*	*0*	*0*	*410*	*191*	*0*	*0*	*12*	*0*	*0*	*3,067*
1941 pres.	***4316**	**0**	**0**	**220**	***521**	**0**	**0**	**0**	**368**	**53**	**55**	**0**	***6?**	**0**	**0**	**1,033**
<interruption by World War II>																
1953				181	160			177	54			153				725
1954	125			446	281		37	123	50			607		181		1,850
1955	13			458			748									1,219
1956	30		105	42					1							178
1957	11		605	54				43	5							718
1958	34			43					39		118					234
Post-war	*213*	*0*	*710*	*1,224*	*441*	*0*	*785*	*343*	*149*	*0*	*118*	*760*	*0*	*181*	*0*	*4,924*
1959 present	**550**	**1,104**	**604**	**1,653**	**364**	**214**	**0**	**191**	**587**	**102**	**247**	**203**	**5**	**147**	**80**	**6,051**

Source: Ikushima (1959); original data from Japanese Consulate in Belém; 1959 present number includes Japanese descendants. Other than above, Maranhão and Piauí had 27 people present as of October 1, 1941; Maranhão had 41 and Piauí had 15 present in 1959.

*1 today's Zona Bragantina

*2 former Colônia Acará

*3 former Ford Concession sold to the Brazilian government after World War II; immigrants were relocated by the order of the Ministry of Agriculture in April, 1955.

*4 including Bragança Railway area (Zona Bragantina)

*5 including vicinity

*6 included in Manaus

Table 3-8. Post-war Japanese immigration, settlement population (including descendants) and farming families in the Brazilian Amazon

Settlement Name	Immigration 1953-77*[1]	Population 1977*[1]	Population 1991*[2]	Population 1996*[3]	1996*[3] Families	1996*[3] Farms	1996*[3] Farm%
<Pará>							
Belém*[4]	567	4,000	2,150	2,750	500	0	0.0
Coqueiro,Tapanã, Ananindeua, Benevides*[5]		765		397	103	23	22.3
†[1] Santa Izabel do Pará (Moema) & Santo Antônio do Tauá*[5]		870	556	438	146	133	91.1
†[2] Castanhal (Curuçá, São Francisco do Pará, Inhangapi)		730	1,010	972	237	144	60.8
Igarapé-Açu		295	158	126	29	28	96.6
Santa Maria do Pará		457	127	137	26	15	57.7
Nova Timboteua		(?)	78	25	6	6	100.0
Capanema*[6]		250	129	67	16	9	56.3
Capitão Poço		(?)	74	80	14	12	85.7
Guamá (Santa Izabel & Inhangapi alongshore Rio Guamá)	722	299	121	148	28	19	67.9
†[3] **Tomé-Açu***[7]	1,791	1,014	1,056	971	224	201	89.7
Daini Tomé-Açu	298	479	198				
Acará - Paes de Carvalho	9	259	224	180	42	42	100.0
Abaetetuba (Barcarena)*[8]	0	300	212	119	31	13	41.9
Altamira (Transamazônica-Prainha)*[9]	140	90	150	108	33	20	60.6
Santarém, Médio Amaoznas	87	255	340	262	75	19	25.3
Belterra (Fordlândia)	690	0					
†[4] **Monte Alegre** (Prainha)	455	130	189	162	43	25	58.1
sub total	*4,759*	*10,193*	*6,772*	*6,942*	*1,553*	*709*	*45.7*
<Amapá>							
Macapá (**Matapi, Fazendínia, Mazagão, Campo Verde**)	355		246				
sub total	*355*	*(?)*	*246*				
<Amazonas>							
Manaus (Cachoeira Grande, suburbs)*[10]	5	1,040	1,500				
Vila Amazônia, Jute Zone	52	630					
†[5] **Efigênio de Salles**	354	252	211				
Bela Vista (Manacapuru, Iranduba)	833	179	103				
sub total	*1,244*	*2,101*	*1,814*				
<Roraima>							
Boa Vista	0	57	128				
Taiano	53	0	0				
sub total	*53*	*57*	*128*				

Table 3-8--continued

Settlement Name	Immigration 1953-77*[1]	Population 1977*[1]	Population 1991*[2]	Population 1996*[3]	1996*[3] Families	1996*[3] Farms	1996*[3] Farm%
<Rondônia>							
Porto Velho	0	106	320				
Treze de Setembro	190	131	102				
Ariquemes	0		219				
Ji-Paraná	0		257				
sub total	*190*	*237*	*898*				
<Acre>							
Rio Branco (**Quinari**)	93	55	240				
sub total	*93*	*55*	*240*				
<Maranhão>							
São Luís (**Rosário, Santa Fé, Muruaí, Estrada Nova**)*[9]	166		265				
Imperatriz	0		86				
Balsas, etc.	0		40				
sub total	*166*	*(?)*	*391*				
<Piauí>							
Piauí (Teresina, Corrente)	0		260				
sub total	*0*	*(?)*	*260*				
Grand Total	***6,720***		***10,749***				

Note: **Bold letters underlined** = Federal settlements; **Bold letters** = State settlements; *Italic letters underlined* = Municipal settlement; Regular letters underlined = ***JAMIC*** settlement; Regular letters = Spontaneous settlements; † Agricultural cooperatives

*[1] Koyama (1978) in Centro de Estudos Nipo-Brasileiros (1980); Immigration (1953-77) means direct entry from Japan, and excludes those moved in from other Japanese settlements.

*[2] Kokusai Kyōryoku Jigyōdan (1991)

*[3] Brazil Amazon Nōgyō Kenkyū Kyōryoku Keikaku (1996)

*[4] Immigration (1953-77) data includes all the following Zona Bragantina locations (from Coqueiro to Capitão Poço); 1991 data includes Coqueiro, Tapanã, Ananindeua, and Benevides; 1996 data is medium of the estimated population (2,500-3,000) in Cidade Belém.

*[5] 1977 data of Moema is included in Benevides, not in Santa Isabel do Pará.

*[6] 1977 data includes Ourém and Bragança.

*[7] Former Acará Settlement (***Colônia Acará***); 1996 data includes Daini Tomé-Açu.

*[8] 1977 data includes Bujaru

Table 3-8--continued

*[9] 1953-77 immigration data from Kokusai Kyōryoku Jigyōdan (1991)

*[10] 1991 data includes Vila Amazônia and Jute Zone

†[1] ***Cooperativa Agrícola Mista Paraense Ltda.*** (*Paraense Sōgō Nōgyō Kyōdō Kumiai*); founded at Coqueiro in 1939, registered in 1956, and moved to Santa Isabel do Pará in 1972

†[2] ***Cooperativa Agrícola Mista Amazônica Ltda. - COPAMA*** (*Amazonica Nōgyō Kyōdō Kumiai*); founded in 1972, and registered in 1977.

†[3] ***Cooperativa Agrícola Mista de Tomé-Açu - CAMTA*** (*Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai*); founded in 1931, and registered in 1949.

†[4] ***Cooperativa Integral de Reforma Agrária de Monte Alegre - CIRAMA*** (*Monte Alegre Nōgyō Kaihatsu Sōgō Kyōdō Kumiai*); founded and registered in 1957.

†[5] ***Cooperativa Agrícola Mista de Efigênio Salles Ltda. - CAMES*** (*Efigênio Salles Nōgyō Kyōdō Kumiai*); founded in 1959, and registered in 1969.

Figure 3-1. Japanese settlements in North and North-eastern Brazil (modified from Fundação IBGE 1992)

Figure 3-2. Northeastern Pará (adopted from Geograf Didática Ltda. 1995)

of the National Institute of Immigration and Colonization (***INIC***). However, ***IAN*** did not report this agreement to its competent authority, the Ministry of Agriculture. When informed of this in April of 1955, The Ministry of Agriculture ordered ***IAN*** to remove all Japanese and protested to ***INIC*** that Japanese were taking jobs away from Brazilian laborers. After this, ***INIC*** suspended all foreign contract labor (***colono***) immigration to the Amazon. Now the dismissed Japanese had to be immediately redistributed to the following places, all unprepared to receive them: Monte Alegre, Pará (358 people); the vicinity of Belém, Pará (127 people); Mazagão, Amapá - then again shifted to Guamá, Pará (101 people); Taiano and Boa Vista, Roraima (71 people); the vicinity of Santarém, Pará (43 people), Alenquer, Pará (36 people), Tomé-Açu, Pará (26 people), and Manaus, Amazonas (23 people). [Ikushima 1959]

The group of 101 people sent to Mazagão was shipped back to the Tapanã immigrant hostel in Belém, before finally being sent to the federal settlement of Guamá in November of 1955. This settlement had been established at the initiative of Dr. Felisberto Camargo of ***IAN*** and Senator Álvaro Adolfo. Its goal was to establish wetland rice production by settling Japanese immigrants over 32,000 ha of flood plains along the Guamá River. Attracted by initial experimental yields of 6 t/ha of harvested paddy, and the

ideal conditions described by the Federation of Overseas Associations of Japan (*Kaikyōren*), immigrants from Japan started to directly enter this area in 1956. Those arriving included ambitious people like the titleholder of 'No. 1 Rice Farmer of Japan (*Komezukuri Nihonichi*),' a dairy farmer, an orchardist, a prefectural assemblyman, a mayor, public servants, policemen, carpenters, blacksmiths, etc. However, these people soon found reality to be far different than their expectations, as lots and housing were not prepared when they arrived. The floodplain lowland was highest on the natural river bank, while the backlands supported swamp forest (***igapó***). They learned that the uncontrollable river would periodically flood their lots, isolating people in their elevated huts, and washing away the rich cultivated soils. There was no transportation provided to Belém except unsafe canoes. Many people drowned in the treacherous river, famous for its tidal waves (***pororoca***). [Ikushima 1959, Han-Amazônia Nippaku Kyōkai 1994, Inoue 1994, Ōe 1994]

The situation was similar or worse in other 'planned' settlements located further into the interior, as indicated by the high exodus rates (Table 3-8). There Japanese immigrants planted rubber trees with technical guidance and financial assistance from the Brazilian government. Until the rubber trees became old enough (7-8 years old) to tap,

Japanese immigrants planted rice, vegetables, black pepper, cacao, coffee, sisal, guaraná, etc., as sources of short-term income. However, the vegetables produced by only two Japanese families were sufficient to saturate the Boa Vista, Roraima market in 1955. In that year this state capital had a population of 7,000 (Wakatsuki 1973). Vegetables produced by 31 Japanese families in the Treze de Setembro Settlement, Rondônia, were far greater than demand in that state's capital, Porto Velho, which had 15,000 residents in 1955 (Gamō 1957). In other remote federal and state settlements, like Bela Vista, Amazonas, and Taiano, Roraima, transportation of farm products to urban markets was extremely difficult. Thus, immigrant families from those interior settlements chose to move to the environs of large cities in both the Amazon and southern Brazil. There they could start over with small-scale horticulture or poultry. Some worked as ***'colonos'*** for already established immigrants, especially in surburban Belém and the Tomé-Açu State Settlement. ***'Patrão'*** Japanese owners of black pepper plantations went to recruit impoverished settlers in the interior, such as Bela Vista in Amazonas. The Municipality of Acará set up a settlement 'Paes de Carvalho' on released state land, that received people evacuating Guamá Settlement (this site has often been mentioned as 'Acará Settlement,' but differs from the Acará Settlement of the Japanese

Plantation Company of Brazil, that is now called Tomé-Açu). [Ikushima 1959, Han-Amazônia Nippaku Kyōkai 1984 and 1994]

Brazil Nihon Imin Hachijūnen-shi Hensan Iinkai (1991) considered these Tsuji & Matsubara immigration projects to have been far from successful, due to 1) ignorance of new immigrants about interior conditions, 2) their unfamiliarity with climate and customs, 3) the large cultural gap between immigrants and other rural residents, 4) lack of effective leadership, 5) lack of crop determination, and 6) a general lack of planning and preparations to receive immigrants. Wakatsuki (1973) cited that 60 percent of Japanese immigrants to the Amazon who settled during 1953-62 evacuated. Some people returned to Japan and sued the Japanese government. However, the same author noted that only such inferior places were left open to Japanese at that time. This situation can be partially understood from the following statistical figures (Kuroda 1987, Kokusai Kyōryoku Jigyōdan 1993): the 3,067 pre-war Japanese immigrants in the Amazon represented only 1.6 percent of the 188,985 pre-war Japanese immigrants in Brazil; the 6,720 post-war Japanese immigrants (up to 1977) in the Amazon represented 12.5 percent; and the 2,265 post-war Japanese immigrants to Nordeste and Mato Grosso (ending by 1963) represented 4.2 percent of the 53,647 (by 1992) post-war immigrants to Brazil.

The 'Black Diamond' Booms and Cooperative Development

Besides the special quota of 'planned' Japanese immigration to officially established settlements, 'called-by-guarantor' (*yobiyose*) immigrants were also permitted within the annual 'free' immigration allotment (see Chapter 2). The 'called-by-guarantor' immigrants worked as ***colonos*** or sharecroppers on the farm of their guarantor, until they obtained their financial independence. The guarantor might be the immigrants' relative, or a relevant local institution such as agricultural cooperative. In August 1953, Tomé-Açu State Settlement received the first post-war immigrants of 29 ***colono*** families (181 people) by the Tsuji quota. During the Black Diamond (***Diamante Negro***) pepper boom (1953-55), a total of 177 families came to Tomé-Açu from Japan, as both 'planned' and 'called-by-guarantor' immigrants. After foreign '***colono***' was forbidden by the Belterra-Fordlândia fiasco in 1955, ***CAMTA*** assumed the role of guarantor to call in additional immigrants from Japan and interior settlements of the Amazon. [Ikushima 1959, Tomé-Açu Kaitaku Gojusshū-nenshi Henshū Iinkai 1985, Kokusai Kyōryoku Jigyōdan 1991]

Masami Oshikiri (1925- ; ***ACTA*** president 1984-94) provides some economic illustrations of the boom atmosphere (Oshikiri, M. 1994). At the time of his arrival in 1955, ¥ 360 (see Appendix M for the Basic Rate) = US$ 1 ≈ Cr$ 38

(note: Cr$ seems somewhat overvalued). Unhusked dried black pepper (***pimenta do reino preta*** = *kuro-koshō*) cost Cr$ 170 (US$ 4.47)/kg, while the real production cost of this pepper was Cr$ 25 (US$ 0.66)/kg. Daily wages in Japan were ¥ 250-280 (US$ 0.69-0.78), while a daily '***colono***' wage at Tomé-Açu was Cr$ 40 (US$ 1.05) for a male, Cr$ 30 (US$ 0.79) for a female, and Cr$ 20 (US$ 0.53) for a minor. According to Gamō (1957), a pre-World War II Tomé-Açu immigrant who owned 12,000 black pepper vines enjoyed a gross income of Cz$ 5,000,000 (≈ US$ 71,000) in 1954. He allocated Cz$ 350,000 (≈ US$ 5,000) for laborers' wages, Cz$ 800,000 (≈ US$ 11,000) for fertilizer, and Cz$ 1,500,000 (≈ US$ 21,000) for farm facilities. This provided him with a net income of Cz$ 2,350,000 (≈ US$ 34,000), allowing him to spend Cz$ 1,000,000 (US$ 14,000) for a round trip back to Japan 29 years after his emigration. This author heard from old immigrants that these travel costs included many generous donations to the needy he met in post-war Japan (i.e., home villagers, former schools, relatives, etc.). This largesse attracted new immigrants to Tomé-Açu.

The local workforce of only new Japanese immigrants was, however, insufficient to perform black pepper harvesting. Izumi and Saitō (1954) describe the 1952 harvest season when black pepper production reached 465 t. More than 1,000 Brazilians from Cametá and Acará gathered to

reap cash income for their labor, which scarecely existed under the traditional ***aviado*** system. Their wages were Cr$ 25-30/day (≈ US$ 0.7-0.9), normal in the Amazon, where wages varied from harvest to harvest (this fluctuation in wages was also true of coffee bean harvests in the south). Working for 2 and one-half months they earned Cr$ 1,000-1,500 (≈ US$ 29-43) per person, and then went home. Workers from Cametá initially canoed almost 300 km down the Tocantins River and up the Acará River for this seasonal employment, but later settled close by to become permanently employed at the expanding black pepper plantations. The ***patrão*** Japanese farmers provided long-term employees with retirement allowances, such as a land lot or a boat together with financing. Thus they began commerce, or planted black pepper at Tomé-Açu or at their home Cametá. [Fujii 1955, Tomé-Açu Sangyō Kumiai 1955, Personal communications]

In 1955, the black pepper production champion of all pre-war immigrants at Tomé-Açu owned 25,830 vines. These yielded 42 tons (t) of dried pepper (an average pre-war immigrant family owned 7,122 vines, which produced 11 t). Each 1,000 pepper vines required 1 permanent laborer to maintain them, and 5 seasonal laboreres for the two month harvest. The largest pepper farmer required 26 permanent workers, plus 130 seasonal harvest hands from Cametá. There were already 400 ha of black pepper plantations at Tomé-Açu

by 1955, having a density of 1,600 vines per hectare, requiring the services of 640 permanent workers plus 3,200 fruit pickers. In that same year, Tomé-Açu farmers also grew 400 ha of sisal, 800 ha of rice, 500 ha of cassava, vegetables, and minor crops on 20,000 ha of 'utilized' land (note: this area probably included fallowed secondary forests, and primary forests used to extract black pepper supports and house constructing timbers). [Gamō 1957]

The ***patrão*** cooperative members now lived in their ***casa grande*** landlord mansions, which dominated the ***barraco*** huts of Japanese and Brazilian plantation laborers. Treatment of workers was still far better than that of workers in average interior settlements. However, post-war Japanese immigrants had been baptized by democratization at home (Staniford 1973, Han-Amazônia Nippaku Kyōkai 1994). Besides, a number of them had been owner farmers in the former Japanese colonies of Asia, such as Manchuria, Korea, and the Pacific islands (Staniford 1973, personal communications). Their ***camarada*** status as daily wage laborers was thus intolerable for some people. Ikushima (1959) cited, of the 191 families (1,249 people) who came to the Tomé-Açu State Settlement by the end of 1958, 52 families (431 people) had moved away to the environs of Belém and to southern Brazil. Conversely, 46 post-war immigrant families (262 people) arrived from interior Amazonian settlements, and 17 pre-war immigrant

families (87 people) who had previously fled from old Acará Settlement returned.

According to Ikeda (1965) Tomé-Açu was a better place than southern Brazil to achieve quick independence, due to:

1) a profitable crop free from serious weather damage (e.g. frost on coffee and vegetables, drought on rice, and hail on fruits in southern Brazil);

2) free land (4-5 years' earnings were needed to purchase land in the South);

3) slow but obedient local laborers;

4) generous ***patrão*** farmers who did not exploit workers, as happened to post-war coffee ***colono*** immigrants in the South;

5) economic 'take-off' beginning in the second year, when some family members began opening their own fields, while others were still earning a wage on ***patrão*** plantations (also cited by Staniford 1973);

6) free use of ***patrão*** tractors in opening new fields;

7) supply of seedlings, agricultural materials, and commodity goods at wholesale prices (by the cooperative through ***patrão*** associates).

By the end of 1958, 74 Japanese pre-war immigrant families (476 people), and 244 post-war immigrant families (1,177 people) were present at Tomé-Açu State Settlement (Ikushima 1959). Black pepper plantations were increasing at Tomé-Açu (see Table 3-9).

Meanwhile, those Japanese who returned to the Belém area from the Tomé-Açu relocation camp after the war reestablished themselves as horticulturists. They invited 29 families from Japan to join them in 1954. This

Table 3-9. Cooperative members and black pepper production at Acará (Tomé-Açu) Settlement

Year	*CAMTA**[1]			B.P. Production (t)*[2]		Related Events
	Member	B.P. Plants	Prod. (t)	Pará	Brazil	
1929						Foundation of Acará Settlement (*Colônia Acará*)
1930						Saburō Takagi recommended black pepper to Hachirō Fukuhara
1931						Jūichi Ikushima introduced local variety to Castanhal Farm
1932						
1933						Makinosuke Usui brought in 20 Kuching variety cuttings from Singapore
1934		2				local variety 6,250+ plants at Castanhal
1935	89	30				local variety 550 plants at Acará Settlement
1936	102	150				Propagation of 'Singapore' variety by Tomoji Katō and Enji Saitō
1937	140	400				
1938	74	750	*[3]0.07			Black pepper contributed 0.2% of the cooperative sales
1939	50	1,000				World War II began
1940	55	1,420				
1941	55	2,200				Pacific War began
1942	54	4,100				
1943	56	5,650	*[4]0.277			
1944	57	8,000				
1945	55	10,050				World War II ended
1946	57	12,905				Acará Farmers' Fellowship Association organized
1947	56	30,550	*[5]21			
1948	53	48,450	*[5]38			Black pepper became the principal product of the cooperative
1949	54	65,490	*[5]69			Tomé-Açu Multipurpose Agricultural Cooperative (*CAMTA*) registered
1950	61	104,590	*[5]80			*CAMTA* opened São Paulo branch
1951	63	172,845	*[5]294			*CAMTA* Quatro Bocas office (old building) was constructed
1952	65	253,555	465			Black pepper contributed 96.6% of *CAMTA* sales
1953	78	332,655	650			Japanese immigration to Tomé-Açu resumed
1954	78	443,893	800			Black Diamond Era (1953-55)
1955	103	564,453	890			First post-War immigrants became independent and joined *CAMTA*
1956	103	670,443	1,200			Black pepper export started (55t to New York)
1957	103	767,230	1,800			Pará State Black Pepper Planters' Central Cooperative (*Cooperativa Central*) founded
1958	176	820,665	2,300			
1959	186	916,500	2,300			Black pepper export was allowed free US$ settlements / Municipal Incorporation
1960	219	1,193,800	2,368			*Cooperativa Central* dissolved / Broker pre-harvest buying began / *Fusarium* infestation began
1961	229	1,586,700	3,200			Daini Tomé-Açu (*JAMIC*) project started / Brazil produced 7% of world
1962	244	1,797,449	2,700			black pepper, of which *CAMTA* contributed 80% (Staniford 1973)
1963	244	2,005,098	3,791			

Table 3-9--continued

Year	CAMTA*[1] Member	CAMTA*[1] B.P. Plants	CAMTA*[1] Prod. (t)	B.P. Production (t)*[2] Pará	B.P. Production (t)*[2] Brazil	Related Events
1964	244	1,952,570	4,138			
1965	271	2,072,134	3,770			***Banco Comercial do Pará*** and ***Banco America do Sul*** opened at Quatro Bocas
1966	304	2,538,992	4,857			
1967	316	2,724,960	5,301			Seasonal laborers 10,000 (CAMTA 1967) / Tomé-Açu pop. 9,059 (IBGE estimated)
1968	325	2,558,170	5,746			Peak of black pepper production at Tomé-Açu
1969	321	2,356,063	5,674			Fusarium breakout / Producers started to move for disease-free lands
1970	314	2,381,031	4,493			Tomé-Açu population 18,600 (IBGE)
1971	289	2,623,932	3,948			
1972	279	2,956,924	4,495			*CAMTA* changed its statute to allow membership from all Pará State
1973	274	2,744,790	4,871	23,150	24,890	Japanese population 2,507 (CAMTA/ACTA 1975)
1974	297	3,031,601	3,099	26,747	27,876	Flooding destroyed black pepper plantations
1975	325	3,948,046	4,038	26,928	28,720	Saburo-Chiba Settlement founded / Tomé-Açu pop. 30,609 (IBGE)
1976	342	2,729,453	3,319	28,312	29,554	***Banco do Brasil*** opened at Quatro Bocas
1977	343	3,402,838	3,627	34,566	35,927	Daisan Tomé-Açu (Aiu-Açu) lotting-out started
1978	350	3,228,817	4,328	44,199	47,015	***Banco da Amazônia (BASA)*** opened at Quatro Bocas
1979	337	3,356,727	3,087	46,289	49,006	
1980	318	3,596,324	3,691	58,264	62,563	Tomé-Açu population 40,337 (IBGE)
1981	318	2,526,413	2,703	35,341	40,436	***JAMIC*** and ***JEMIS*** closed
1982	301	2,269,010	2,719	47,927	51,083	
1983	259	1,515,398	1,117	29,374	32,346	*CAMTA* reconstruction started
1984	213	1,339,599	1,079	40,148	43,599	JICA emergency loan to ***CAMTA*** through ***Banco America do Sul***
1985	215		722	34,705	37,941	Tomé-Açu population 55,644 (IBGE)
1986	205		827	41,863	45,440	
1987	195		989	41,964	45,917	Japanese-Brazilian population 1,416 (ACTA)
1988	191		1,079	55,757	59,417	
1989	188		1,206	60,501	65,530	
1990	180		830	71,441	78,155	
1991	176		677	75,299	83,906	Tomé-Açu population 63,375 (IBGE)
1992	169		352	25,288	33,034	
1993	149		214	34,464	42,270	
1994	133		360	27,836	34,711	Tomé-Açu population 42,149 (IBGE estimated)
1995	133		494	27,780	*[6]33,680	
1996	118		282			Japanese-Brazilian population 1,542 (ACTA)
1997	109		219			

Table 3-9--continued

*[1] Data of 1934-51 are from Izumi & Saitō (1954); of 1952-84 are from Tomé-Açu Kaitaku Gojusshūnen Saiten Iinkai (1985); ***CAMTA*** members of 1985-96 are from Jigyō oyobi Kessan Hōkokusho (***CAMTA*** Annual Business Report and Statement of Accounts); black pepper 'liquidation' of 1985 is from Jigyō oyobi Kessan Hōkokusho, and of 1986-97 are from Recebimento de Produtos (***CAMTA*** Annual Receipts of Products). Staniford (1973) cited increased rate of non-cooperative members from 0% in 1957 to 40% in 1964. According to the author, Tomé-Açu produced 6,000 t of black pepper in 1964, of which CAMTA members contributed 4,000 t, but marketed only 3,000 t through the cooperative. Tanaka (1995) cited that ***CAMTA*** associates were about 60% of Tomé-Açu famers in 1991. Besides, during 1987-91, 13-29% of associates were inactive (didn't use the cooperative). The author estimated ***CAMTA*** could collect only 20-33% of the black pepper harvest at Tomé-Açu during 1987-90. Since 1970's, black pepper production and liquidation of ***CAMTA*** members include those produced in the fields outside of Tomé-Açu.

*[2] Data from each year's Anuário Estatístico do Brasil published by Fundação Instituto Brasileiro de Geografia e Estatística - IBGE

*[3] Ikushima (1959)

*[4] Acará Sangyō Kumiai (1944) 'Dai Jūsan-ki Senkyūhyakuyonjūsan-nendo Kessansho' (Statement of Accounts of the 13th Term, Fiscal Year 1943)

*[5] Tomé-Açu Sangyō Kumiai (1967)

*[6] Besides Pará, includes Espírito Santo 2,828 t; Bahia 2,280 t; Maranhão 751 t; and Paraíba 41 t (these four states consist 17.5% of national production).

convenient suburban location attracted other post-war immigrants fleeing from interior settlements. In 1956, the Paraense Multipurpose Agricultural Cooperative (***Cooperativa Agrícola Mista Paraense Ltda.*** = *Paraense Sōgō Nōgyō Kyōdō Kumiai*) was incorporated at Coqueiro, Belém. Ikushima (1959) counted 272 families (1,373 people) in the Belém area at the end of 1958. Eighty-nine families (377 people) lived in the town (***Cidade Belém***), 30 families (173 people) lived at Tapanã, 77 families (419 people) lived at Ananindeua, 13 families (70 people) lived at Moema, 44 families (265 people) lived at João Coelho, and 19 families (69 people) lived at Barcarena. Except for the town residents, 183 families were farming, of which 55 owned their own land. About 100 families produced vegetables, which satisfied 80 percent of the vegetable demand from Belém's 200,000 people. [Ikushima 1959]

By 1957, 104 families (including horticulturists) near Belém owned 384,700 black pepper plants on 294 ha, second only to the 253 families of Tomé-Açu State Settlement, who possessed 764,731 plants on 478 ha. Together these two regions accounted for 95 percent of the 377 Japanese black pepper producers (about half of Japanese families) in Pará, where there was a total of 1,211,331 plants on 824 ha. In that same year, there were already 544 Brazilian families who owed 451,963 plants on 220 ha. Black pepper cultivation

had also reached Maranhão and Amazônas, brought by other Japanese farmers. [Ikushima 1959]

The Tomé-Açu Multipurpose Agricultural Cooperative (*CAMTA*) petitioned the Brazilian government to protect domestic black pepper production, and won an import prohibition in September of 1952. This was achieved due to the government's lack of foreign exchange reserves. Thus, black pepper from the Amazon was preferred over imported pepper, though it sold at double the international price. The average cooperative sale price for black pepper shifted as follows: Cr$ 93/kg in 1952, Cr$ 135/kg in 1953, Cr$ 180/kg in 1954, and Cr$ 150/kg in 1955 (US$ 1 = Cr$ 35-40). During this period, the cooperative upgraded its facilities and operations. A three-story headquarters building was completed at Quatro Bocas in 1955, costing Cr$ 1,300,000 (≈ US$ 32,500). Three warehouses, and a workshop at Quatro Bocas, and a warehouse on the Tomé-Açu wharf were also built. In 1955, *CAMTA* expected the Brazilian market to be quickly saturated with black pepper (estimated domestic consumption of 1,200 t), so asked the federal government for permission to export black pepper. Export permission was approved in 1956. That year, the domestic price of black pepper fell to Cr$ 65/kg, and bottomed out at Cr$ 34/kg in 1957. The farmers were dismayed by this bolt out of the blue. These 'nouveaux-riches' had become accustomed to

wasteful habits during the euphoric Black Diamond period: constructing mansions, having parties with influential Brazilians from Belém, making donations locally, sending funds to impoverished family members at home, and traveling to Japan and the US. The cooperative's management had also become lax. [Izumi and Saitō 1954, Tomé-Açu Sangyō Kumiai 1955, Tomé-Açu Sangyō Kumiai 1961a]

The old ***CAMTA*** board members resigned en masse, and 11 people in their 30s were elected new directors on April 17, 1957. Tanio Oshikiri (1911-87) became president (***diretor-presidente*** = *rijichō*), Noboru Abe (1920-73) became managing director (***diretor-gerente*** = *senmu-riji*), Satoshi Sawada (1919-) became secretary (***diretor-secretário*** = *shōgai-riji*), and Takeshi Taketa (1922-) became executive director (***diretor-executivo*** = *jōmu-riji*) (terms: April 1957-April? 1969). The new management formulated a three-year reconstruction plan which included:

1) compulsory collection of Cr$ 7/kg of black pepper as a capital share increase for the cooperative, and reimbursement of individual share portions exceeding Cr$ 200,000 through installments over three years;

2) separate accounting for the cooperative's hospital (formerly the Japanese Plantation Company of Brazil's Agua Branca branch hospital), collective purchasing sector, repair shop/petrol services, and the fertilizer sector; and

3) personnel cuts.

[Tomé-Açu Sangyō Kumiai 1961a, Tomé-Açu Kaitaku Gojusshū-nenshi Henshū Iinkai 1985]

The slump had been caused by overproduction of Pará black pepper, which reached 2,300 t in 1957 (Tomé-Açu produced 1,800 t and ***Zona Bragantina*** produced 500 t), in contrast to estimated domestic demand of only 1,500 t. ***CAMTA***, however, hoped to increase Brazilian black pepper production to more than 10,000 tons/year (t/yr), to compete effectively in international markets. To achieve this production goal, farmer initiative had to be improved by removing the exploitation by middlemen. The Pará State Black Pepper Planters' Central Cooperative (***Cooperativa Central dos Plantadores de Pimenta do Reino do Estado do Pará*** = *Pará Shū Koshō Saibai Gyōsha Chūō Kumiai*) was therefore founded in August of 1957. Its goal was to give marketing assistance to all Japanese and Brazilian black pepper producers in Pará. Only Tomé-Açu farmers had previously established cooperative sales channels of black pepper, which accounted for 80 percnet of the domestic market. Hence, ***CAMTA*** allocated five of its board members to the new cooperative's management, and transferred control of its sales network to them. However, the scratch team of the Central Cooperative management did not last long, and stopped functioning in 1959 (then disbanded in August of 1960). The failure was caused by producers who did not like

troublesome cooperative regulations, which again opened opportunities for middlemen to eat into the black pepper businesses. Even at Tomé-Açu, new immigrants with small-scale operations, who were not yet permitted to join ***CAMTA***, relied on middlemen. The latter would purchase even small amounts of product for cash, without strict quality control. [Tomé-Açu Sangyō Kumiai 1961a, Staniford 1973]

Meanwhile, in November of 1959 the Brazilian government removed foreign exchange controls on black pepper exporters, which permitted ***CAMTA*** to receive payments in US$. This was a blessing to cooperative producers, who were experiencing accelerating domestic inflation. In December of 1959, husked dried 'white' black pepper (***pimenta do reino branca*** = *shiro-koshō*) was valued at US$ 950/t on the New York market, and then surpassed US$ 1,300/t in 1960. This second boom was caused by disease that damaged black pepper plantations in Southeast Asia, and helped post-war immigrants to get quickly established economically. They organized the Tomé-Açu Post-War Immigrant Liaison Council (*Tomé-Açu Sengo Ijūsha Renraku Kyōgikai*) in April of 1959 and were soon able to attain:

1) long-term fertilizer loans from the Japanese government without mortgage or interest;

2) prompt distribution of lots from ***CAMTA*** and access to membership to keep farmers from moving out of the settlement;

3) construction of the Breu Elementary School (***Grupo Escolar Dr. Dionysio Bentes de Carvalho*** = *Breu Shōgakkō*).

Boom conditions attracted an additional 65 families from Japan from 1960 to 1961. The Maoka Agricultural High School of Tochigi prefecture opened a farm in Breu in 1960, and sent nine single graduates who would later become leading Tomé-Açu farmers. [Tomé-Açu Sangyō Kumiai 1961a, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

The Spice Economy and Municipal Incorporation of Tomé-Açu

With the rise of the black pepper economy, the agricultural cooperative became the top authority at Tomé-Açu State Settlement. The cooperative paid taxes and implemented public works projects according to Brazilian law. These included road construction and maintenance, the operation of schools, keeping public order, public health and hygiene efforts, etc., that were financed by the restored local tax. ***CAMTA***'s president acted on behalf of the ***CETA*** manager, distributing ±25 ha lots to each family (an additional lot was provided if a family had an 18+ year old boy or more than five children). Titles of ownership to these lots were provided by the state government upon request. Maintenance of roads was shared by cooperative members, each being responsible for 230 m of trunk road, 100 m of branch roads and 200 m of private roads. The

cooperative ran a hospital at Agua Branca, which rendered services to anyone at cost. In 1951, ***CAMTA*** transferred administrative tasks to district meetings (*kukai*) and educational responsibilities to the Acará Education Association (*Acará Kyōiku-kai*, founded on March 1, 1951), while remaining their major sponsor and supervisor. The cooperative subsidized four elementary schools in the settlement, to assure their proper maintenance and to attract good teachers from Belém. Izumi and Saitō (1954) report that in 1952 teachers were paid Cr$ 1,000-1,300 (≈ US$ 28-36) monthly, in addition to their state salaries of Cr$ 500 (≈ US$ 14). Finally, cultural activities and settlement events were also sponsored by the cooperative: e.g., baseball (*yakyū*, began in 1933) and the immigration anniversary (*nyūshokusai*) when an athletic meet (*undōkai*) and amateur singing contest (*nodojiman*) were held. Public activities increased with the arrival of post-war immigrants, and these were supported by the established ***'patrão'*** class. [Izumi and Saitō 1954, Gamō 1957, Staniford 1973, Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

As the pioneer society grew in terms of population (Japanese, Cametaense and Acaraense), administrative needs, and political and socio-cultural activities, ***CAMTA*** was no longer capable of administering both its original economic

functions and everything else. Municipal autonomy was deemed the appropriate next step, to recover substantial local tax and respond to the needs of the growing community. The Tomé-Açu Sangyō Kumiai (1955) stated that the black pepper settlement was contributing 80 percent of all tax revenues to the Municipality of Acará (***Município de Acará;*** the county seat located 70 some kilometers downstream Tomé-Açu Town), and that the settlement was even revitalizing the once depressed economy of Belém (see Tables 3-10 and 3-11). Satoshi Sawada (1919-), ***CAMTA***'s director of public relations, led negotiations with the state seeking incorporation of the Municipality of Tomé-Açu (***Município de Tomé-Açu***). This was achieved on September 1, 1959, when Pará's 60th municipality was created by separating itself from the Municipality of Acará. Its area was 5,828 km^2, almost equal to the original land concession of the Acará Settlement (***Colônia Acará***), and it had a resident population

Table 3-10. Tomé-Açu State Settlement population, May 1959

Ethnicity	Class	Students
Japanese 1,624 (234 families)	Workforce 773 (M 411 F 362) Dependent 801 (M 424 F 377) *Colonos**[1] 50 (M 50)	Secondary+*[2] 66 (M 34 F 32) Elementary 370 (M 200 F170)
Brazilian 3,214 (360 families + 500 single pop.)	Jap.Farm Workforce 1,056 (M 799 F 257) Jap.Farm Dependent 1,000 (M 500 F 500) Rural Farmer, etc. 1,158	Elementary 185 (M 108 F 77)

Source: Tomé-Açu Sangyō Kumiai (1959)
*[1] attached to patrão families
*[2] studying apart from parents, in Belém, Rio de Janeiro, São Paulo, etc.

Table 3-11. Tomé-Açu State Settlement farm census, May 1959

Farm Facility, Machinery, Livestock, Crop and Quantities			
<Buildings>*[1]			
Houses*[2] 260 Colono Houses 157	Warehouses 186 Laborer Sheds 389	Garages 65 Elementary Schools 4	Workshops 125
<Machinery/Equipments>			
Ships 5 Disc Harrows 66 Ricemill Machines 46	Trucks 56 Tractors 97(L33,S64) Rice Threshers 37	Dump Trucks 18 Tractor-Tillars 93 Generators 60	Ploughs 73 Hand-Op.Tractors 11 Water Pumps 42
Motors 164 (34 ≥HP10> 70 ≥HP5> 60)		Black Pepper Shuttering Machines 89	
Black Pepper Driers 25		B. Pepper Sun Drying Plastic Sheets 17,171	
<Livestock>			
Hens/Cocks 7,161 Cows 11	Chicks 5,572 Horses 11	Sows/Boars 448 Other Animals 81	Piglets 452
<Crops>	(area)	(harvest)	(notes)
Black Pepper*[3]	1,175.5ha	2,310,250kg	harvest of 1958
Rice	873.5ha	1,364,280kg	60kg x 22,738 bales
Grass	395.5ha		green mulch, pasture
Cassava	292.0ha	2,920,000kg	10t tuber/ha
Fruits, etc.	142.0ha		homegarden
Corn	129.7ha	129,700kg	1t grain/ha; feed
Vegetables	23.9ha		homegarden
<Producer Income>			
Total Cr$ 128,111,000 (≈ US$ 710,000) (Black Pepper Cr$ 115,512,500 = 90.2%; Others Cr$ 12,598,500 = 9.8%)			

Source: Tomé-Açu Sangyō Kumiai (1959)
*[1] ***CAMTA*** facilities (incl. hospital) are seemingly excluded.
*[2] Total floor area of wood-tip (***cavaco***)-roofed houses was 6,030 m², and of tile (***telha***)-roofed houses was 18,872 m².
*[3] There were 716,720 mature and 408,090 immature plants.

of 7,808 by 1960. Tomé-Açu's first mayor was Nei Carneiro Brasil (1916- ; term December 1959-January 1963). He was a former ***CETA*** radio operator who had once provided Japanese with factual world news that saved them from post-war confusion (see Chapter 2). Two '*jun-nisei*' (locally educated child immigrants), Satoshi Sawada (1919-) and his younger brother, Gilberto Fukashi Sawada (1922-91) became two of the first seven municipal councilors. It was agreed

that the elected councilor representing **CAMTA** would always become the council chair, regardless of the current majority party. [Gamō 1957, Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

After Tomé-Açu's incorporation, the cooperative decided to hand over tasks such as education, public health and hygiene, road maintenance, and immigrant legal procedures to the District Federation (*Chiku Rengōkai*). The Federation evolved from the District Chief Council (*Kuchō Rengōkai*) in May of 1962. Each of the districts (map in Figure 5-1 of Chapter 5) of Tomé-Açu (wharf), Boa Vista, Ipitinga (east and west), Quatro Bocas, Mariquita, Arraia (north and south), Agua Branca, and Breu (i-viii) had district meetings (*kukai*) and district chiefs (*kuchō*). These were comparable to hamlet meetings (*burakukai*) and hamlet chiefs (*burakuchō*) in Japan. All Japanese family chiefs (*koshu*) at Tomé-Açu participated in a district meeting (*kukai*), either established **CAMTA** associates or new immigrants who were not yet allowed to the cooperative. The District Federation (*Chiku Rengōkai*) thus became analogous to a village (*mura*)-level institution, and its chairman (*kaichō*) could be considered a village mayor (*sonchō*). Though the District Federation was not an officially registered organization, it provided supplemental aid to the new municipality office

through donations and labor services from Japanese immigrants. The District Federation's first assignment was to conduct a survey of the local population, hygiene conditions, laborer migration, and economic conditions for the Tomé-Açu Settlement Malaria Prevention Committee (*Tomé-Açu Shokuminchi Malaria Bōatsu Iinkai*), which was organized at ***CAMTA*** in April of 1962. ***CAMTA*** was colaborating in this public health effort with the Malaria Eradication Bureau at Tomé-Açu (***CEM-TA*** [***Cômoda de Erradicação da Malária em Tomé-Açu***]). This successful teamwork put an end to the 1961 malaria epidemic by 1964, removing the major obstacle for continued immigration and agricultural development. The District Federation subsequently acted with ***CAMTA*** and the municipality office to establish a state junior high school (***Ginásio Estadual Antônio Brasil***) at Tomé-Açu Town (***Cidade Tomé-Açu***) in March of 1963. In that year, the first Japanese-Brazilian (*nikkei*) mayor, Gilberto Fukashi Sawada (1922-91), was elected (term November 1963 to January 1969). He had promoted the Second Settlement (***Segunda Colônia*** = *Daini Tomé-Açu*) project as a councillor, an effort to create a satellite settlement calling new immigrants from Japan, that advanced rapidly during his administration. The electrification of Tomé-Açu Town (***Cidade Tomé-Açu;*** the wharf district) was achieved in 1964, with the installation of a thermal power plant. A new pier was also constructed. In

addition, a terminal building and a 2,000 m paved runway of the Tomé-Açu Airport (***Aeroporto Dr. Dionysio Bentes;*** first opened in 1954), was completed at Quatro Bocas in 1964. The airport offered regular Cessna services to Belém twice a day, which shortened the 15 hour boat trip to 40 minutes. [Kōya no Hoshi 1967, Staniford 1973, Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

In November of 1966, the District Federation (*Chiku Rengōkai*) was reorganized to become the Tomé-Açu Cultural Association (***ACTA*** [***Associação Cultural de Tomé-Açu***] = *Bunkyō* [*Tomé-Açu Bunka Kyōkai*]) registered in 1970, which had its new offices facing ***CAMTA*** headquarters across the main street of Quatro Bocas. The new association's first chairman was Haruo Ōnuma (1908-93; term 1966-83). The association was dedicated to provide the services listed below.

1) Cultural exchange and cooperation with the Municipality of Tomé-Açu
   - Colaboration with the Malaria Eradication Bureau at Tomé-Açu (***CEM-TA*** [***Cômoda de Erradicação da Malária em Tomé-Açu***]) for malaria control
   - Support for elemantary schools
   - Administration of the public cemetery
   - Road maintenance
   - Immigrant legal procedures: naturalization, elector registration, alien registration, and permanency
   - Driver license exams, plate renewal, vehicle tax payments
   - Seminar on Brazilian Labor Standards Act, labor contracts, and laborer registration

2) Mutual help among immigrants

- Settlement family registration ('*koseki*') including ID number, nationality, land title number, tax payer number, car plate, etc.
- Notice to the Japanese Consulate in Belém of deaths, moves, marriage, and registration of Japanese nationality
- Participation with the Pan-Amazônia Japanese-Brazilian Association (***Associação Pan-Amazônia Nipo-Brasileira*** = *Han-Amazônia Nippaku Kyōkai*) to provide facilities such as the student dormitory in Belém, movie rental, etc.
- Participation with the Amazônia Japanese-Brazilian Beneficence Society (***Beneficência Nipo-Brasileira da Amazônia*** = *Amazônia Nippaku Engo Kyōkai*) for a traveling clinic, vaccinations, and the Amazônia Hospital of Quatro Bocas (***Hospital Amazônia de Quatro Bocas*** = *Jūjiro Byōin*; inaugurated in 1988)
- Coordination with the Tomé-Açu Multipurpose Agricultural Cooperative (***CAMTA*** [***Cooperativa Agrícola Mista de Tomé-Açu***] = *Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai*)
- Coordination with Tomé-Açu Agricultural Promotion Association (***ASFATA*** [***Associação Fomento Agrícola de Tomé-Açu***] = *Tomé-Açu Nōson Shinkō Kyōkai*; founded in 1981) for the use of heavy machines donated by the Japan International Cooperation Agency (JICA = *Kokusai Kyōryoku Jigyōdan*)
- Coordination with Tomé-Açu Electrification and Rural Telephone Cooperative (***COERTA*** [***Cooperativa de Eletrificação e Telefonia Rural da Região Geoeconômica de Tomé-Açu Ltda.*** = *Tomé-Açu Nōson Denka Denwa Kumiai*; founded in 1987) for rural electrification and telephone systems
- A hall facility for wedding parties (*kekkon hirōen*), amateur entertainment (*engeikai*), amateur singing contest (*nodojiman*; later *karaoke taikai*), farewell/welcome parties (*kansōgeikai*), dance parties, seminars, conferences, general meeting, Bon Festival dance (*Bon-odori*), Respect-for-the-aged Day celebration (*Keirōkai*), university admission and graduation commemorations (*nyūgaku sotsugyō iwai*), etc.
- Immigration Anniversary (*Kaitaku Kinensai*) in cordination with ***CAMTA***, the Catholic church (***Igreja São Francisco Xavier***), and Municipality of Tomé-Açu
- ***ACTA*** Movie Theater (1964-84; held 100 times x 2 films in 1973)

- Construction and support of the ***Igreja São Francisco Xavier*** at Quatro Bocas, dedicated to the patron saint of the Japanese and Tomé-Açu (founded in 1959; construction committee chairman Tadao Satō, land donated by ***CAMTA***)
- Construction and support of the *Tomé-Açu Nishi-Honganji* buddhist temple (constructed in 1967, rebuilt in 1981)
- Student dormitory with Japanese language school at Quatro Bocas (inaugurated in 1979)

3) Club activities
- Tomé-Açu Youth Club (*Tomé-Açu Seinenkai*; organized in 1931)
- Mah-jongg Club (since 1932)
- Photo Club (*Shashin Dōkōkai*; organized in 1953)
- Go Club (*Igo Club*; organized in 1956)
- Japanese Chess Club (*Shōgi Club*)
- Entertainment Club (*Geinō Club*; organized in 1957)
- Amateur band 'King Rose' (founded in 1959, derived from a band started in 1931; later named ***'Diamante Negro'***)
- Tomé-Açu Japanese-Brazilian Association (***ANBTA*** [***Associação Nipo-Brasileira de Tomé-Açu***] = *Niseikai* [*Tomé-Açu Nippaku Seinenkai*]; founded in May, 1959) for social intercourse of ***'nissei'*** who returned home after studying in the cities. They constructed the Nisei Hall (*Nisei Kaikan*, completed in December 1973) at Quatro Bocas, and Niseikai Pool (swimming pool and club, inaugrated in November 1979) at Agua Branca.
- Great River Haiku Association (*Taiga Kukai*; formed in 1960) published various collective anthologies.
- Tomé-Açu Newspaper (*Tomé-Açu Shinbun*; founded in 1973, evolved from '*Ryokufū*,' a news organ of ***CAMTA*** employees since 1965)
- Women's Federation (*Fujin Rengōkai*; 14 district groups united in 1973); activities included lectures, study tours, handicrafts classes, cooking classes, dressmaking classes, fashion shows, table tennis competitions, mother-and-child party, fifteenth anniversary for girls (***Festa de Quinze Anos***), charity bazar for ***Igreja São Francisco Xavier***, wreath making for All Souls' Day (***Dia dos Finados*** = *Obon*), dining arrangements for parties and general meetings
- 4H Club (*Yon-Eichi Club*; organized in the early 1970's)

4) Sports activities
   - Athletic meet (*Undōkai*)
   - Tomé-Açu Judo Society (*Tomé-Açu Jūdōkai*; organized in 1959)
   - Tomé-Açu Baseball League (*Tomé-Açu Yakyū Renmei*; organized by 7 district (***ramal*** = *ku*) teams in 1960; derived from *Acará Yakyūbu*, founded in 1933)
   - Tomé-Açu Table Tennis Club (*Tomé-Açu Takkyū Club*; organized in 1960)
   - Tomé-Açu Sumo Club (*Tomé-Açu Sumō Aikōkai*; organized in 1974)
   - Tomé-Açu Kendo Club (*Tomé-Açu Kendō Club*; organized in 195x)
   - Karate Group
   - Tomé-Açu Gateball Club (*Tomé-Açu Gateball Aikōkai*; organized in 1985)
   - Tomé-Açu Country Club (TACC = *Tomé-Açu Country Club*; founded in 1989)

5) Japanese Language Education
   - Tomé-Açu Japanese Language School (*Tomé-Açu Nichigo Gakkō*; since 1929)

[Izumi and Saitō 1954, Kōya no Hoshi 1967, Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Personal Observations]

The Daini Tomé-Açu Project

The Tomé-Açu Sangyō Kumiai (1961) states that while the immigrants established many black pepper plantations, they still did not have a junior high school. Children had to be separated from parents and sent to Belém or São Paulo for their studies. This was costly not only economically, but took a toll on family ties and the moral education of young people. Yet local access to family leisure activities, medical services, and commodity goods was limited at Tomé-

Açu, and expensive due to the settlement's small population. They hoped further immigration of at least 1,000 families from Japan would strengthen this isolated society in the Amazon. Additional human resources were expected to bring in more progressive knowledge of agricultural and modern society, revitalizing the settlement and the cooperative.

On April 17, 1959, the Tomé-Açu Second Settlement Construction Preparation Committee (*Tomé-Açu Daini Ijūchi Kensetsu Junbi Iinkai*) was organized in **CAMTA**, with Tadao Satō (1914-95) as its chairman, and Haruo Ōnuma (1908-93) as the vice-chairman. The committee appealed to the Japanese government and the public through the distribution of pamphlets. For three months beginning in June of 1959, the Japanese government dispatched a survey mission (*'Amazon Chōsadan'*), which included a counselor and a section chief from the Ministry of Foreign Affairs, four technical officials (soil, forest, agricultural engineering, and agricultural economics) from the Ministry of Agriculture, and the chairman of the Budget Bureau of the Finance Ministry. The Ministry of Foreign Affairs sent its Emigration Bureau chief to Tomé-Açu in October of 1959. It also sent a mission led by Saburō Chiba (1894-1979) in November of 1959, on the 30th anniversary of Japanese immigration. Representatives from the Japanese Consulate General in Belém, the Federation of Overseas Associations of

Japan (*Kaikyōren*) Amazon Branch, the Emigration Promotion Corporation (*Ijū Shinkō*) Belém Branch, and ***CAMTA*** immediately had a meeting about this new settlement project. The roles of each of these parties were agreed upon at this meeting. The Consulate would take care of communication with the Japanese government and general oversight. The Federation of Overseas Associations of Japan was responsible for immigrant reception and agricultural extension. The Emigration Promotion Corporation was responsible for the purchase, preparation and lotting of land (see Chapter 2). ***CAMTA*** would be responsible for general cooperation at the local level. In the meantime, Satoshi Sawada (1919-), ***CAMTA***'s public relations director, negotiated with the Pará state government to acquire state land adjacent to the settlement's Breu district. [Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Daini Tomé-Açu Ijūchi Nijūnen-shi Hensan Iinkai 1984, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Kokusai Kyōryoku Jigyōdan 1988b]

On November 15, 1960 land ownership certificates were delivered for 30,600 ha, assigned to 17 Japanese names from Tomé-Açu. Of this total, 4,800 ha were reserved for rural Brazilian settlers without land titles (***posseiros***) by the municipality, and 25,800 ha were designated for the Daini Tomé-Açu (***Segunda Colônia***, alias ***JAMIC***) Project. The Tomé-Açu Second Settlement Construction Preparation Committee

started surveying the new site in October of 1960. The preparatory committee was reorganized to become the Colonization Division (*Takushokubu*) of ***CAMTA*** in November of 1960, after the second visit of the Japanese Emigration Bureau chief to make final arrangements. The introduction of 800 families within a 5 year span was projected, and the Japanese government announced its final decision in November of 1961. On January 15, 1962, the Japan Migration and Colonization Ltd. (***JAMIC-Imigração e Colonização Ltda.*** = *JAMIC Ishokumin Yūgen Gaisha;* see Chapter 2) opened a temporary office at ***CAMTA*** headquarters. Road construction started on June 5, 1962. The 30 post-war immigrant families already at Tomé-Açu created the Daini Tomé-Açu Development Fellowship Association (*Daini Tomé-Açu Kaitaku Dōshikai*) chaired by Hiroshi Seki (1903-69), from which 25 families were given lots by drawing on September 14, 1962. These families completed 75 ha of tree felling along the new main street at the First Center (***Primeiro Centro*** = *Daiichi Center;* later Ipiranga District) of Daini Tomé-Açu on September 30. The felled slash was burnt on November 18, 1962. The Daini Tomé-Açu Agricultural Cooperative (*Daini Tomé-Açu Nōgyō Kyōdō Kumiai*), with President Hiroshi Seki (1903-69), was organized on November 10, 1962. [Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Daini Tomé-Açu Ijūchi Nijūnen-shi Hensan Iinkai 1984, Tomé-Açu Kaitaku

Gojusshū-nenshi Henshū Iinkai 1985, Kokusai Kyōryoku Jigyōdan 1988b]

The first 6 families (30 people) of direct immigrants from Japan arrived on October 3, 1963. The same month, Elizabeth Saunders Home of Ōiso, Kanagawa Prefecture, started construction of San Stepano Farm (325 ha) at the First Center. It was a project of Miki Sawada (1901-80), an Iwasaki Family (*Mitsubishi Zaibatsu*) member who founded the Home for half-blood orphans of US soldiers in 1948. Sawada sent 7 young volunteers for the construction and then to help 20 orphans who started arriving in August of 1965. This month, immigration to the Second Center (***Segundo Centro*** = *Daini Center;* later Cuxiu District) also began. By 1967, ***JAMIC*** had constructed a clinic (which was enlarged in 1969), an agricultural cooperative office, two community centers, two elementary schools (***Escola Reunida Ipiranga*** at First Center and ***Escola Isolada Esperança*** at Second Center), two police stations, a nursery, and a sports ground. During 1963-76, a total of 58 families (246 people) had immigrated to Daini Tomé-Açu directly from Japan. Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai (1975) noted that Japanese families at Daini Tomé-Açu increased from 34 in 1964 to 211 in 1974. These figures include farmers resettled to Daini Tomé-Açu, who were 1) branch families of Tomé-Açu, 2) former ***colono*** families at Tomé-Açu, and 3) those moved in from

other locations of Brazil and Paraguay. Besides, some commuter (*kayoi-saku*) farmers from Tomé-Açu are counted in 1974. Organizations that were established to promote the autonomy and economic welfare of the new settlement are contained in the following list:

1) Daini Tomé-Açu Agricultural Cooperative (*Daini Tomé-Açu Nōgyō Kyōdō Kumiai*; November 10, 1962-December 28, 1967)
   - coordination with ***JAMIC*** (concerning establishment of public utilities, elementary schools, clinics, police stations, roads and bridges; leasing of rice-cleaning machines, sawing machines, and vehicles; and agricultural financing)
   - education
   - agricultural extension (Agriculture Study Group = *Nōji Kenkyūkai* organized on December 14, 1965)
   - collective purchasing and distribution

   The cooperative participated in CAMTA as a group. After 1965, however, farmers with more than 500 kg of annual black pepper production were allowed individual ***CAMTA*** membership if they wished. Eventually, all members joined ***CAMTA***, and in 1967 all credits and debts of Second Tomé-Açu Agricultural Cooperative were taken over by Daini Tomé-Açu District Association.

2) Daini Tomé-Açu District Association (*Daini Tomé-Açu Chikukai*; March 20, 1964-December 31, 1973)
   - education, hygiene, culture, public peace, cemeteries, administration of leased matters from ***JAMIC***, road maintenance, and plant disease control

   Only name existed while the Daini Tomé-Açu Agricultural Cooperative was active. Reorganized to Daini Tomé-Açu Village Association.

   Daini Tomé-Açu Village Association (*Daini Tomé-Açu Jichikai*; January 1, 1974-)
   - coordination with ***JAMIC*** and its Agriculture Experiment Stations
   - maintenance of infrastructure, road, park and cemetery
   - education, culture and sports
   - public peace and hygiene
   - agricultural finance

- plant disease control
- community forestry of brazilnut trees

3) Machinery Administration Committee (*Kikai Un'ei Iinkai*; October 25, 1974-October 24, 1976)
   - management of heavy machinery leased from ***JAMIC*** for plant disease control, road maintenance, farm development, and product transportation

Originated from Plant Disease Control Committee (*Shokubutsu Bōeki Iinkai*) formed under Daini Tomé-Açu District Association in 1969, later expanded to ***ASPRO***

Daini Tomé-Açu Agricultural Assistance and Promotion Association (***ASPRO*** [***Associação de Assistência e Promoção Agrícola de Daini Tomé-Açu***] = *Daini Tomé-Açu Nōgyō Shinkō Kyōkai*; October 9, 1976-March 31, 1982; registered on November 17, 1976)
   - management of heavy machinery leased from ***JAMIC***
   - running school bus

4) Daini Tomé-Açu Youth Association (*Daini Tomé-Açu Seinenkai*; August 10, 1966-)
   - recreation

5) Daini Tomé-Açu Women's Association (*Daini Tomé-Açu Fujinkai*; May 25, 1967-)
   - school of cooking, arts and crafts, folk dance, and Japanese dance
   - Respect-for-the-aged Day celebration (*Keirōkai*), Bon Festival dance (*Bon-odori*), amateur entertainment (*Engeikai*)
   - dining arrangements for the 20th-year coming-of-age ceremony (*seijinshiki*), merriage (*kekkonshiki*), funeral (*sōshiki*), and anniversary of death (*kaiki*)

6) Daini Tomé-Açu Frends-of-Agriculture Association (*Daini Tomé-Açu Nōyūkai*; March 14, 1980-December 31, 1982)
   - coordination with the Agriculture Experiment Stations of ***JAMIC***
   - introduction of new varieties (e.g. black pepper, mangostin, blazil nut, mango, pig, fish, etc.)
   - seminar

Derived from Production Committee (*Sangyō Iinkai*; 1974-80) of Daini Tomé-Açu Village Association (*Daini Tomé-Açu Jichikai*); later expanded to Tomé-Açu Frends-of-Agriculture Association (*Tomé-Açu Nōyūkai*; January 1, 1983-)

[Tomé-Açu Sangyō Kumiai 1967, Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Daini Tomé-Açu Ijūchi Nijūnen-shi Hensan Iinkai 1984, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Nikkei Colônia 1988, Kokusai Kyōryoku Jigyōdan 1991]

Evading Market Risks - Crop Diversification and Agroindustry Development

Protecting Tomé-Açu's black pepper growers from undesirable price fluctuations in the black pepper market was an urgent community issue. Izumi and Saitō (1954) noted that in 1952 ***CAMTA*** already listed 'diversified management' as its goal for the following year. This was at a time when black pepper accounted for 96.6 percent of farmers' incomes. Tomoji Katō (1898-1956), the black pepper pioneer, had been attempting sisal hemp as a second crop (*daini sakumotsu*) since the end of World War II. The cooperative planned to construct an agricultural research station, and asked the Japanese government to send appropriate specialists in 1953. In 1954, 12 ***CAMTA*** members organized the Mechanical Farming Study Group (*Kikaikanō Kenkyūkai*), and launched a 5-year rice cultivation plan. They intended: 1) economic risk evasion of black pepper monoculture; 2) self-sufficiency of Japanese staple food at Tomé-Açu, especially for the recent '***colono***' immigrants; 3) effective use of the settlement's

1,000 ha of secondary forest; and 4) production of organic fertilizer from rice straw for black pepper. However, it was not until the sudden fall of black pepper prices in 1957 that farmers became really aware of the risks associated with pepper-dominated agricultural practices. [Tomé-Açu Sangyō Kumiai 1954, Tomé-Açu Sangyō Kumiai 1955]

In April of 1957 new immigrants who had participated in the inaugural training program of the International Collaboration of Farmers, Japan (*Nihon Kokusai Nōyūkai*) in California, USA, organized the Agriculture Consultation Meeting (*Nōji Sōdankai*) with interested farmers. This was renamed the Agriculture Study Meeting (*Nōji Kenkyūkai*) in December of 1957, and joined by the second group of the International Collaboration of Farmers, Japan trainees as well as graduates from the Tokyo University of Agriculture (*Tōkyō Nōgyō Daigaku*). These new immigrants had been inspired by Tadaatsu Ishiguro (1884-1960), an influential agrarianist and agricultural administrator during 1920s and 1930s, and his aide Tadao Sugino (1901-65). Ishiguro and Sugino initiated in 1935 the Farming Village Rehabilitation Association (*Nōson Kōsei Kyōkai*), the predecessor of International Collaboration of Farmers, Japan, to promote independent small farms. With the nomination of Ishiguro, Sugino became the first head (term 1956-65) of the Department of Agricultural Colonization (*Nōgyō Takushoku*

Gakka) of Tokyo University of Agriculture. This department was founded by the president Saburō Chiba (1894-1979; term 1955-59) to produce leading immigrant farmers. Besides, Sugino was an advisor to the Japan Student League for Emigration (*Nihon Gakusei Kaigai Ijūrenmei*) founded in 1955, in which he exercised strong leadership as its first chairman (term 1961-65). [Tomé-Açu Sangyō Kumiai 1961b, Nihon Gakusei Kaigai Ijū Renmei 1966, Sugino Tadao Sensei Tsutō Bunshū Henshū Iinkai 1966, Chiba 1977]

The motivated young people of Agriculture Study Meeting began making meteorological observations in 1958, recording temperature, precipitation, humidity, and evaporation. The Agriculture Study Meeting became active under its new chairman Tadao Satō (1914-95) in January of 1959, creating four specialized research divisions by December of 1959: Agricultural Management and Economics (subdivisions of Management and Economics); Agricultural Techniques (subdivisions of Soil & Fertilizer, Cultivation, and Diseases & Pests); Livestock (for self-supply of fertilizer and animal protein); and Experimental Cropping. They tested crops to supplement black pepper culture, such as: 1) ipecac (*Cephaelis ipecacuanha*), 2) clove, 3) red pepper (*Capsicum annuum*), 4) olive (*Olea europaea*), 5) turmeric (*Curcuma longa*), 6) urucu, and 7) cacao. Cacao was reintroduced in 1958 from Cameta on the Ikeda and Kimura farms. Other

candidates like coffee, rubber, coconut, lime (*Citrus aurantifolia*), orange, rose apple (*Eugenia jambos*), passionfruit (*Passiflora edulis*), brazilnut, papaya, banana (*Musa* spp.), pinapple (*Ananas comosus*), açai (*Euterpe oleracea*), and guaraná were also test planted by individuals. Keizō Iwama (1903-76), one of Hisae Sakiyama's (1875-1941) disciples who came from Maués, Amazonas, led in guaraná cultivation. Most new crops grew well in old black pepper fields, absorbing residual fertilizer. However, product marketing remained the bottleneck. The Agriculture Study Meeting organized a Agriculture and Livestock Products Contest (*Nōchikusanbutsu Hinpyōkai*) on the occasion of the Immigration Anniversary (*Nyūshoku Kinensai*) of November 15th, to encourage farmers to produce better quality products and to promote consumption. [Tomé-Açu Sangyō Kumiai 1961b]

In 1960, the infestation of an unidentified disease that killed black pepper plants became a serious problem for the first time. This was anticipated before by the presence of disease-infected plants, and by general lessons of other plantation crops in the tropics (Izumi and Saitō 1954). However, farmers had not conceived of the grave risk associated with the genetic homogeneity of ***'Singapura'*** variety (Albuquerque and Duarte 1991), which was propagated vegetatively from only two cuttings. The Agriculture Study

Meeting organized the Black Pepper Disease & Pest Control Committee (*Koshō Byōgaichū Taisaku Iinkai*) in July of 1960, and assessed the cause of death to 636,000 plants during October of 1960. The committee reported that 8,157 (1.3 percent) died due to root-rot, 4,414 (0.7 percent) died due to water damage, and 3,121 (0.5 percent) die due to drought. For extension purposes, they published an informational magazine called 'The Soil' (*Tsuchi*) in that month. ***CAMTA*** provided full support of their activities, and Committee membership reached 62 people by the next year. [Tomé-Açu Sangyō Kumiai 1961b]

In 1962, ***CAMTA*** established its Agricultural Extension Division (***ATEA*** [***Assistência Técnica e Extensão Agrícola***] = *Nōjibu*), with an attached Agronomic Experiment Station (***Campo Experimental de Agronomia*** = *Nōji Shikenjō*; 5 ha until 1984) at Quatro Bocas, next to the ***Igreja São Francisco Xavier*** Catholic church. The station's mission was to study: 1) black pepper diseases; 2) fertilizer application; and 3) new crops, as part of its agricultural extension work. Agronomist Muneo Tsuruzaki (1935-), a graduate of Utsunomiya University (*Utsunomiya Daigaku*), became the station's chief (term 1967-72). He worked in coordination with agronomists José Maria P. Condurú and Fernando Carneiro de Albuquerque, and pedologist Ítalo Cláudio Falesi (1932-) of the Northern Agriculture and Livestock Research Institute

(***IPEAN*** [***Instituto de Pesquisas e Experimentação Agropecuárias do Norte***]; formerly ***IAN***, and today's ***CPATU***). The fatal black pepper disease was identified as the fungus *Fusarium solani* f. sp. *piperis* in 1961 by Fernando C. de Albuquerque (Watanabe 1973). This theory was endorsed at the University of California, USA, by Professor William C. Snyder who examined the plant specimens from Pará. [Tomé-Açu Sangyō Kumiai 1967, Daini Tomé-Açu Ijūchi Nijūnenshi Henshū Iinkai 1984, Tsuruzaki 1995]

When the black pepper market went flat during 1966-67 (bottoming out at US$ 470/t for unhusked dried black pepper), ***CAMTA*** was forced to send Tsuruzaki on five trips to collect new crop species. From 1968 to 1972 Tsuruzaki visited Central American, the Caribbean, and South & Southeast Asian countries. He was provided with introductory letters from ***IPEAN***, but usually had to smuggle his specimens home. Before Tsuruzaki's retirement, the ***CAMTA*** Experiment Station had acquired: 1) ipecac, 2) clove, 3) Indian snakeroot (*Rauwolfia serpentina*), 4) candlenut or kukui (*Aleurites moluccana*), 5) nutmeg (*Myristica fragrans*), 6) cardamom (*Elettaria cardamomum*), 7) Trinidad ginger (*Zingiber officinale*), 8) allspice (*Pimenta dioica*), 9) Chinese cinnamon (*Cinnamomum cassia*), 10) piassava (*Attalea funifera*), 11) vanilla (*Vanilla plantifolia*), and 12) mangosteen (*Garcinia mangostana*). It was hoped that these

species could replace the dying black pepper, to avoid single crop succession and to diversify farm management. [Tomé-Açu Sangyō Kumiai 1967, Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975]

To support ***CAMTA***'s research initiatives, and to help make the Daini Tomé-Açu project a success, ***JAMIC*** decided to relocate its Monte Alegre Experimental Farm (*Monte Alegre Shiken Nōjō*) to Ipiranga District of Daini Tomé-Açu. It had been established as a nursery of the Overseas Associations of Japan (*Kaikyōren*) Amazon Branch in 1957, at the former Santa Rosa Farm of Hachirō Fukuhara, where Ōsaka YMCA Amazon Development Youth Group (*Amazon Kaitaku Seinendan*) had first struggled and then abandoned the site (Ikushima 1959). In December of 1966 the Daini Tomé-Açu Experimental Farm (*Daini Tomé-Açu Shiken Nōjō*; 230 ha), the sole ***JAMIC*** research facility, started trials with 1,000 black pepper saplings in the field. It fostered the formation of the Plant Disease Control Committee (*Shokubutsu Bōeki Iinkai*) under Daini Tomé-Açu Village Association (*Jichikai*), to fight a black pepper mosaic virus that had appeared in 1968. Farmers were leased glasstanks for the spraying of chemicals. The experimental farm also sponsored lectures and field trips for interested people, and distributed various seeds and saplings. It had demonstration plots of clove, vanilla, rubber tree, guaraná, cacao, coconut, rose apple, jackfruit

(*Artocarpus integrifolia*), and breadfruit (*Artocarpus incisa*). [Daini Tomé-Açu Ijūchi Nijūnenshi Henshū Iinkai 1984, Kamimura 1984, Kokusai Kyōryoku Jigyōdan 1988a and 1988b]

Meanwhile, ***CAMTA*** dispatched its managing director, Noboru Abe (1920-73), to Japan in September of 1962, to request the involvement of a Japanese agroindustry utilizing black pepper. The Japanese government sent the Black Pepper Industry Research Mission (*Koshō Sangyō Chōsadan*) to Tomé-Açu in December of 1962, in compliance with its immigration policy towards the Amazon. The *Kanebō* Corporation (its local marketing company: ***Indústria Química e Comércio Kanebo do Brasil S.A.***) and the Takasago Essence Industry Corporation (*Takasago Kōryō Kōgyō Kabushiki Gaisha*, through a local production company called ***Bras-Essência Takasago Ltda.***) showed interest on a joint venture with ***CAMTA***, to extract black pepper oleoresin and oil. ***CAMTA*** also hoped to develop the oil production potential of the oil palm (*Elaeis guineensis*) as an alternative to black pepper. The Takasago Amazon Essence Institute (*Takasago Amazon Kōryō Kenkyūjo*) was opened in Daini Tomé-Açu in September of 1963, and its 26 ha farm began growing 10,000 black pepper plants. These plants produced up to 80 t, but were wiped out by the *Fusarium* disease shortly thereafter. Alternative test crops like Ceylon cinnamon (*Cinnamomum zeylanicum*), sassafras

(*Ocotea cymburum*), canella (*Canella winterana*), clove, lemon grass (*Cymbopogon* spp.), patchouli (*Pogostemon patchouli*), urucu, turmeric, cotton tree (*Bombax ceiba*), macadamia (*Macadamia tennifolia*), etc. were then planted. [Tomé-Açu Sangyō Kumiai 1961a, Tomé-Açu Sangyō Kumiai 1967, Kōya no Hoshi 1967, Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Daini Tomé-Açu Ijūchi Nijūnenshi Henshū Iinkai 1984, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

In November of 1964 an experimental oil extraction processing plant was inaugurated near the Tomé-Açu wharf. The plant had a monthly production capacity of 250 kg of oleoresin (10 percent of the raw material) and 25 kg of oil (2 percent of the raw material). It was supposed to add great value to Tomé-Açu's black pepper, even utilizing abortive grain (***chocha***), thereby protecting the area from black pepper market fluctuations. However, the factory could not collect enough raw material, due to the low price it offered to farmers. In 1969, patchouli was planted on the Takasago Farm and 6,400 saplings were distributed to interested farmers as a substitute for black pepper. This also failed. In 1974, Takasago planned a 3,000 ha sassafras plantation and a safrole extraction factory in Pará, which did not work out. In 1975 the Takasago Institute moved to Taperoá, Bahia, where some Tomé-Açu farmers had resettled on disease-free soil to grow black pepper since 1970. The

vacant factory was closed in May of 1977, and the experimental farm at Daini Tomé-Açu was entrusted to a local caretaker. [Tomé-Açu Sangyō Kumiai 1967, Kōya no Hoshi 1967, Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Daini Tomé-Açu Ijūchi Nijūnenshi Henshū Iinkai 1984, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

Fusarium Outbreak - The Search for New Land and Research on Alternative Crops

Dispersing immigrants and black pepper

In the early 1960s several adventuresome Tomé-Açu farmers began looking for larger lots beyond the settlement, supposedly still free from black pepper diseases. The *Fusarium* infestation of 1969 accerelated these searches for new lots. When asked his opinion, Muneo Tsuruzaki (1935-) of ***ATEA*** recommended that farmers search in the Castanhal and Igarapé-Açu areas, though this would run counter to the interests of ***CAMTA*** (Tsuruzaki 1995). Remote and scattered black pepper fields could make the pre-harvest production assessment (*kenmi;* the basis of cooperative financing enforced during 1957-94) a difficult task. Resourceful farmers fully benefitted by the cooperative finance for their large remote fields might eventually leave Tomé-Açu, and withdraw from ***CAMTA***. Often young ***nissei*** successors moved out first to create branch farms in the ***Zona***

Bragantina, where other family members followed later. A group of people from Ipitinga District (mostly originating from Miyagi Prefecture, Japan) moved to Taperoá, Bahia during 1970-71. It was known that Japanese immigrants in nearby Ituberá, Bahia, were successfully cultivating clove and black pepper. [Han-Amazônia Nippaku Kyōkai Castanhal Shibu 1975, Kokusai Kyōryoku Jigyōdan 1991]

In 1971, Pará's municipal mayors visited Tomé-Açu, and offered farmers free land. That year 120 Japanese families (83 from Tomé-Açu and 37 from the vicinity of Belém) applied to receive such land at the Municipality of Moju. To counter this move ***CAMTA*** received a 7,000 ha concession from Pará State at Marupaúba, which was located 12 km northeast of Tomé-Açu Town (***Cidade Tomé-Açu***) across the Acará-Mirim River. Takeshi Taketa (1922- ; ***CAMTA***'s director 1957-69 and 1973-83, president 1978-79) coordinated distribution of 100 ha lots in 1971 (Taketa 1995). During this period black pepper culture was spread by Japanese immigrants, and by Brazilians who worked at Japanese farms (see Table 3-12). In 1972, ***CAMTA*** changed its statute to allow membership from all Pará State. The cooperative built warehouses at Ananindeua and Castanhal in 1977, to collect black pepper from the local members who had moved out of Tomé-Açu. Besides black pepper, Tomé-Açu farmers took their homegarden crops with them when moving. Tadao Gotō (1950-98) of

Ipitinga District took cupuaçu (*Theobroma grandiflorum*), bacuri (*Platonia insignis*), and piquiá (*Caryocar villosum*) all the way from Tomé-Açu to Taperoa, Bahia (Gotō 1996). This author saw an agroforestry plantation of more than 50 Amazonian fruit and timber tree species at Takehiro Miyamoto Farm, Ituberá, Bahia in December of 1994. Miyamoto was also a Tomé-Açu farmer. These dispersed immigrants developed new human networks, while keeping their old contacts (relatives, friends, and *CAMTA* membership). Such linkages facilitated a continuous flow of agricultural information and crop seed/sapling material among Japanese settlements. [Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

Table 3-12. Black Pepper plants in Brazil in 1973

Location	# Plants	Location	# Plants
Tomé-Açu*1	3,994,790	Macapá	14,000
Acará*2	435,000	Amapá State total	14,000
Guamá	280,000	Bela Vista	50,000
Moema, Benevides*2	100,000	Efigênio de Salles	50,000
Santa Isabel do Pará*2	500,000	Amazonas State total	100,000
Castanhal*2	2,000,000	Treze de Setembro	10,000
Santa Maria do Pará*2	150,000	Rondônia State total	10,000
São Miguel do Guamá*2	80,000	Maranhão State	22,000
Km. 48 (= Mãe do Rio)*2	50,000	Mato Grosso State	500,000
Ourém, Capitão Poço*2	100,000	**Legal Amazônia Total**	**9,055,790**
Abaetetuba*2	500,000		
Monte Alegre	95,000	Bahia State	200,000
Santarém	35,000	Pernambuco State	100,000
Transamazônica	90,000	São Paulo State	50,000
Pará State total	8,409,790	**Other States Total**	**350,000**

Source: Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975 (original data from *CAMTA* and *JEMIS* in Belém)
*1 *CAMTA* members 2,744,790 plants; non-associate Japanese 450,000 plants; non-associate non-Japanese 800,000 plants.
*2 settlements to which Tomé-Açu farmers resettled with black pepper plants.

Infrastructural development and satellite settlements

The exodus of farming families from Tomé-Açu was further aggravated by a crop disease outbreak in 1973, and crop water damage in 1974. Many black pepper plantations were ruined to such an extent that the Pará state government ordered the suspension of all financing of black pepper planting. In April of 1973 the Tomé-Açu Cultural Association (***ACTA***) resolved to implement a satellite settlement plan for Daisan Tomé-Açu, or Tomé-Açu Three. This plan was intended to halt the erosion of the Tomé-Açu community, by acquiring sizable lots of undiseased soils within daily commuting (*kayoi-saku*) distance for local farmers. Satoshi Sawada (1919-) was appointed to negotiate the Daisan Tomé-Açu Plan with the state government. From June 26 to 28, 1973, Pará's governor, Fernando José de Leão Guilhon (term 1971-75) assembled his first mobile government at Tomé-Açu. Two state settlement plans were approved: for Aiu-Açu (Daisan Tomé-Açu: 151,200 ha) and for Ubim (Saburo Chiba Settlement: 11,500 ha). Free land was offered to farmers at both sites. In addition, the governor promised to help Tomé-Açu by constructing a road, a school, a hospital, a power station, a water supply system, and a bridge over the Acará-Mirim River. This effort was intended to provide substantial support to help revitalize the municipality representing the third largest tax base in Pará

(Chiba 1975). The governor expressed the hope that black pepper production in the area be increased three times (Ōnuma 1974). The board members of ***ACTA*** and ***CAMTA*** organized the Daisan Tomé-Açu Settlement Development Preparation Committee (*Daisan Tomé-Açu Ijūchi Zōsei Junbi Iinkai*) on July 29, 1973. [São Paulo Shinbunsha 1974, Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Yaeo 1985, Kokusai Kyōryoku Jigyōdan 1988a]

On November 4, 1973 state route ***Rodovia PA-02*** (***Estrada Governador Dionysio Bentes***, today's ***PA-256***) was opened to traffic between Paragominas and Daini Tomé-Açu. On December 12, 1973 a surfaced road (today's ***PA-451***) was inaugurated between Tomé-Açu and Santa Isabel do Pará. Branching westward from this main thoroughfare at Caninde (Breu 5-8 District), the Tomé-Açu-Mocajuba Road (***Estrada Água Azul***, today's ***PA-256***) was opened in 1974, providing access to Daisan Tomé-Açu. Thus, the once isolated settlement was connected to the Belém-Brasilia Highway (***BR-010***), and to what is today's Belém-Marabá Highway (***PA-475/150***). The Tomé-Açu Bridge over the Acará-Mirim River was inaugurated on November 15, 1975. [Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Yaeo 1985]

This new infrastructure helped farmers search for lots with good soil in areas other than state concessions, where they were inevitably forced to compete with the small landholders by occupation (***posseiros***). Tomé-Açu farmers purchased branch farms to the east of the Acará-Mirim River along ***PA-451***, at another location also called Agua Branca and at Itabocal of Tomé-Açu. They further searched out lands along the road within today's Municipality of Concórdia do Pará, and Municipality of Bujaru. In 1975, the Pará government authorized final plans for Saburo Chiba Settlement (***Colônia Saburo-Chiba*** = *Chiba Saburō Shokuminchi*). On the borders of the Municipality of Tomé-Açu and the Municipality of Acará, about 20 km northwest of Quatro Bocas, 10,000 ha of land was lotted out to 42 Japanese names. However, official implementation of the Daisan Tomé-Açu was delayed, and numerous ***posseiros*** entered the planned area about 70 km southwest of Quatro Bocas. They had heard of the building of a new state road that would pass through both the Municipality of Tailândia and the Municipality of Moju. On June 27, 1976, the Daisan Tomé-Açu Land Development Promotion Committee (*Daisan Tomé-Açu Tochi Zōsei Sokushin Iinkai*) evolved from the preparation committee in order to secure 100 ha lots within the granted land for 662 names. ***JAMIC*** leased two bulldozers, a trailer, a grader, a dump truck, a power

shovel, and three jeeps to this committee. The committee members managed to begin demarcating lots on January 4, 1977. The committee was incorporated on July 30, 1977 as the Tomé-Açu Agricultural Promotion Commission (***COFATA*** [***Comissão de Fomento Agrícola de Tomé-Açu***] = *Tomé-Açu Nōson Shinkō Iinkai*), a subsidiary of ***ACTA***. The leased machinery was eventually donated to this commission. [São Paulo Shinbunsha 1974, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Kokusai Kyōryoku Jigyōdan 1988a]

Meanwhile, Governor Guilhon's pledges of infrastructural development at Quatro Bocas Town (***Cidade Quatro Bocas***) were realized, assuring its growth into the economic hub of the Municipality of Tomé-Açu. The thermal power plant and the public hospital were inaugurated on September 12, 1974. The latter replaced ***CAMTA***'s Central Hospital at Agua Branca (former branch hospital of the Japanese Plantation Company of Brazil), which had been a financial burden to the cooperative for a long time (in 1973 the Central Hospital had treated 5,051 Japanese and 5,382 Brazilians, serving more non-cooperative than cooperative members, and had run up a deficit of Cr$ 31,963 ≈ US$ 5,200). Roadside stalls along the main street ***Avenida Dionysio Bentes*** mushroomed into a local shopping district. In 1976 the Bank of Brazil (***Banco do Brasil***) opened a branch office in front of ***CAMTA***. The ***Banco BRADESCO*** followed suit

in 1977. The ***Banco da Amazônia*** (***BASA***) relocated from Tomé-Açu Town (***Cidade Tomé-Açu***) to the lot next to the ***Banco do Brasil*** in 1978. Along with the pre-existing ***Banco America do Sul*** (operated 1965-94), these financial institutions at Quatro Bocas fostered development of the local agricultural and commercial sectors. Thus a weekly routine has been established whereby business owners from the entire municipality gather at Quatro Bocas every Friday. They negotiate with banks and the cooperative (if members) to obtain financing, withdraw funds to pay laborers' salaries and allowances, and purchase farm supplies. On Saturday afternoons and Sundays, rural laborers ride to Quatro Bocas with their weekly paychecks for shopping and entertainment. [Tomé-Açu Sangyō Kumiai and Tomé-Açu Bunka Kyōkai 1975, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Personal observations]

It was planned that Tomé-Açu's satellite settlements would first be planted with black pepper, followed by cacao, tropical fruits, livestock development, and economic tree species. Even in the new isolated settlements, black pepper would only survive for 5 years (formerly more than 20 years by Gamō 1957, and Yoshida 1984) before succombing to rapid infection by *Fusarium* through the air. Considering this risk, farmers employed lower input management, producing an average of only 2 kg of dry black pepper per mature plant

(formerly 4 kg by Izumi and Saitō 1954). Land preparation costs had to therefore be offset by secondary crops, if farmers would not opt for speculative, large scale and highly mobile monocultures, or 'gypsy agriculture' (*gypsy nōgyō*) by their term. However, due to poor maintenance of state and municipal roads, many farmers soon had to give up 'commuter farming' (*kayoi-saku*). [Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Personal observations and communications]

Institutional crop research efforts

In April of 1974 ***JAMIC*** expanded the former Daini Tomé-Açu Experimental Farm (*Daini Tomé-Açu Shiken Nōjō*) into the Amazon Tropical Agriculture Experiment Institute (***INATAM*** [***Instituto Experimental Agrícola Tropical da Amazônia***] = *Amazônia Nettai Nōgyō Sōgō Shikenjō*; 568 ha). It was dedicated to accelerating research in alternative tropical crops, with the study of black pepper diseases being a long-term goal. On November 5, 1977, the institute's new facilities (see Tables 3-13 and 3-14) were inaugurated. They were staffed by a team of 12 people, including academic experts in plant biology and pathology, extension specialists, and local immigrant farmers hired for their outstanding practices and farm-based study initiatives. The institute worked in collaboration with ***EMBRAPA-CPATU***, the University of Brasília (***Universidade de Brasília***), the

Piracicaba Agricultural College (***Escola Superior de Agricultura Luiz de Queiroz de Piracicaba***), etc. [Kokusai Kyōryoku Jigyōdan Belém Shibu 1977, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

Table 3-13. Facilities of ***INATAM*** in 1986

Category	Floor Area	Material # Bldg.	Category	Floor Area	Material # Bldg.
<Research & Admin.>	1,860.4m²		<Housing Facilities>	(cont.)	
Headquarters	598.1	brick 1	Employee Housing	273.7	brick 4
Old office	128.3	wooden 1	Student Housing	232.0	brick 1
Pathology Laboratory	256.0	brick 2	Laborer Housing	80.0	wooden 2
Nematode Isolation Room	70.0	brick 1	<Farm Facilities, etc.>	577.1m²	
Crop Research Building	296.0	brick 1	Farm Machinery Shed	198.4	brick 1
Glassroom	296.0	fe.conc. 2	Garage	107.7	brick 1
Darkroom	216.0	wooden 2	Powerhouse	40.0	brick 1
<Housing Facilities>	1,495.2m²		Irrigation Pomp Shed	34.0	wooden 1
Chief Housing	84.0	brick 1	Warehouse	57.0	brick 1
Manager Housing	80.0	brick 1	Compost Shed	60.0	wooden 1
Staff Housing	745.5	brick 10	Cow Shed	80.0	wooden 1

Source: Kokusai Kyōryoku Jigyōdan (1988b)

Table 3-14. Experimental crops of ***INATAM*** in 1977

Category	Species
Industrial Crops	black pepper (*Piper nigrum*), guaraná (*Paullinia cupana*), coffee (*Coffea arabica*), cacao (*Theobroma cacao*), oil palm (*Elaeis guineensis*), vanilla (*Vanilla fragrans)*, clove (*Syzygium aromaticum*), allspice (*Pimenta dioica*), cardamon (*Elettaria cardomomum*), nutmeg (*Myristica fragrans*), sugarcane (*Saccharum officinarum*), etc.
Tropical Fruits	castard apple (*Annona squamosa*), biriba (*Rollinia deliciosa*), soursop (*Annona muricata*), passionfruit (*Passiflora edulis*), cupuaçu (*Theobroma grandeflorum*), papaya (*Carica papaya*), murucí (*Byrsonima crassifolia*), orange (*Citrus sinensis*), lemon (*Citrus limon*), lime (*Citrus aurantifolia*), bread fruit (*Artocarpus incisa*), etc.
Sort-term Crops	corn (*Zea mays*), rice (*Oryza sativa*), sesame (*Sesamum indicum*), beans, tubers
Tree Plantation	brazilnut (*Bertholletia excelsa*), pau santo (*Zollernia paraensis*), mahogany (*Swietenia macrophylla*), erythrina (*Erythrina poeppigiana*), acacia (*Acacia* spp.), freijó (*Cordia goeldiana*), andiroba (*Carapa guianensis*), etc .
Palms	coconut (*Cocos nucifera*), açai (*Euterpe oleracea*), babaçu (*Orbignya* spp.), coyol (*Astrocaryum mexicanum*), peach palm (*Bactris gasipaes*), etc.
Grasses	capim-elefante (*Pennisetum purpureum*), colonião (*Panicum maximum* cv. colonião), quicuio da Amazônia (*Brachiaria humidicola*)

Source: Kokusai Kyōryoku Jigyōdan Belém Shibu (1977)

Following the establishment of ***INATAM*** in 1974, ***CAMTA***'s Agronomic Experiment Station altered its course from expensive studies (the station's 1973 deficit was Cr$ 62,938 ≈ US$ 10,300) to extension directly related to farm management. Results from its comparative growth studies of black pepper were shared with ***INATAM***. These included: 1) new field versus replanted field trials; 2) ***'Singapura'*** versus more recently introduced variety trials; and 3) full sun versus canopy shading using trees (and other tropical crops) trials. ***CAMTA*** purchased three lots (No. 156-158; 63ha) at Breu II District, and opened an ***ATEA*** (*Nōjibu*) nursery in 1974 which produced seedlings of cacao (250,000), coffee (150,000), and shade trees (50,000). Cacao had been chosen as the major alternative crop to black pepper by the cooperative's management in 1970. The first Bahian hybrid seeds of cacao were introduced by the Executive Commission of Cacao Farming Plan (***CEPLAC*** [***Comissão Executiva do Plano da Lavoura Cacaueira***]) in 1971. ***CAMTA*** invited ***CEPLAC*** to build a research station at Tomé-Açu, which took place in 1976. [Tomé-Açu Sangyō Kumiai/Tomé-Açu Bunka Kyōkai 1975, Oliveira 1981, Daini Tomé-Açu Ijūchi Nijūnenshi Henshū Iinkai 1984]

Farmer initiatives for new crops

Crop diversificaiton efforts produced encouraging results in the ***Zona Bragantina***, especially in Santa Isabel

do Pará and Castanhal. Enterprising people had moved there, leaving their old homes at Tomé-Açu and other interior settlements. While less handicapped in terms of market access, the founders of these voluntary settlements could not expect institutional support from the Japanese government initially. Isao Kitagawa (1914-) recalled (Kitagawa 1994) that most of these people had 'rebelled' against official immigration arrangements, and had chosen to start over by undertaking suburban horticulture of leaf vegetables and grafted tomatoes on wild jua stock. This was hard work under the sun, but required little capital. Financing through the Bank of Brazil (***Banco do Brasil***) helped get them established as black pepper plantation owners, leaving horticulture to the local Brazilians who mastered the necessary techniques by working on Japanese farms (a group of these farmers formed a ***'Cintura Verde'*** or Green Belt for vegetable production at Areia Branca District of Santa Isabel do Pará). [Han-Amazônia Nippaku Kyōkai 1984, Nikkei Colônia 1988, Kokusai Kyōryoku Jigyōdan 1988a, Han-Amazônia Nippaku Kyōkai 1994, Personal communications and observations]

When the black pepper disease appeared, Japanese farmers in the ***Zona Bragantina*** took quick, decisive, and persistent action. Sumito Nakata (1928-) of Santa Isabel do Pará acquired two seedlings of mangosteen from ***IPEAN*** in

1967. It took eight years for these individuals to fruit, and another two decades until mangosteen became highly appreciated in Brazilian markets. Kokusai Kyōryku Jigyōdan (1996) reported that Nakata had 1,000 trees, each producing 300-400 fruits annually, fetching an average price of R$ 1 (≒ US$ 1)/fruit. Nakata has also been attempting to grow durian (*Durio zibethinus*) of Malaysian breed since 1988, and acquired good variety of seed from Thailand in 1996. [Nikkei Colônia 1988, Personal observations]

The Spanish melon (*Cucumis melo*) test planted by Fukuichi Kitagawa (1927-) and Hidehiko Fujiwara (1936-) at Santa Isabel do Pará in 1968 became highly prized in São Paulo, and soon spread to Inhangapi, Pará. The Castanhal Agricultural Shipment Cooperative (*Castanhal Shukka Kumiai*) was organized by 16 melon farmers in 1972, when annual production peaked at 1,700 t. Meanwhile, a Tenri-kyō missionary, Akihiro Shirakibara (1923-), introduced Hawaiian papaya (*Carica papaya*) to the farm of Azuma Maruoka (1911-) at Santo Antônio do Tauá in 1970. Papaya production reached commercial scale at Castanhal in 1974, due to the efforts of Noboru Ōya (1929-) and Narao Yamase (1942-). That year heavy rainfall destroyed many black pepper fields, accerelating crop conversion efforts. The papaya producers joined the melon cooperative, which was incorporated as the Amazônica Multipurpose Agricultural

Cooperative (***COPAMA*** [***Cooperativa Agrícola Mista Amazônica Ltda.***] = *Amazônica Nōgyō Kyōdō Kumiai*) in 1977. These new cash crops spread rapidly among Japanese farmers in the Amazon, then to Nordeste and further south, with centers of production always moving closer towards large domestic markets. [Han-Amazônia Nippaku Kyōkai 1984, Nikkei Colônia 1988, Kokusai Kyōryoku Jigyōdan 1988a, Han-Amazônia Nippaku Kyōkai 1994]

A group at Santa Isabel do Pará founded the Santa Izabel Livestock Breeding Company (***Agro Pecuária Izabelense Ltda.*** later ***Grupo Apil***) in 1972. It became the first chicken hatchery operation in the Amazon. Associates of the Paraense Multipurpose Agricultural Cooperative (***Cooperativa Agrícola Mista Paraense*** = *Paraense Nōgyō Kyōdō Kumiai*) also moved into poultry production. According to Han-Amazônia Nippaku Kyōkai (1994), Japanese poultry production in this region reached 800,000 hens during the 1980's, and 1,500,000 broilers in 1986, making them the major poultry suppliers in Pará. The Governo do Estado do Pará (1995) cited that the Paraense Agricultural Coop produced 3,000,000 chicks and 10,000 t of feed in 1994. [Nikkei Colônia 1988]

Farmers also adapted the scrambling passionfruit plant to the supports left in old black pepper plantations. The supports were linked overhead with a wire, on which trunk vine of passionfruit was attached parallel to the ground.

Fruit bearing branches hung from the wire like a curtain. This system was established by Mitsuji Shimomaebara (1914-94) at Tomé-Açu in 1972. The Brazilian government awarded him the Marshal Rondon Medal (***Medalha Marechal Candido Mariano da Silva Rondon***) for this contribution in 1974. Passionfruit production at Tomé-Açu increased from 1974 to its peak in 1977-78, when ***CAMTA*** made annual shipments of 7,000 t to juice factories in Recife, Minas Gerais, and São Paulo. However, the federal government took notice of this success, and provided massive financing to small Brazilian farmers for passionfruit culture in the Nordeste Region. This led to a market collapse during 1978-81, and abandonment of passionfruit culture in the Amazon. In the 1990s, large São Paulo varieties of passionfruit were becoming popular among Japanese-Brazilian farmers in the ***Zona Bragantina***. The off-season products from the Amazon were appreciated in southern Brazilian markets. Besides, traditional varieties had revived for supplying raw material to local juice factories. Today, passionfruit is a popular relay crop in agroforestry systems of black pepper and intercropped tree species. [Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Kokusai Kyōryoku Jigyōdan 1988a, Personal observations]

Oil palm planting in old black pepper fields began at Santa Isabel do Pará in 1976. According to the Governo do

Estado do Pará (1995), the president of Paraense Agricultural Coop, Paulo Toshio Ōhashi (1917- ; term 1960-75), called a general assembly knowing that 3,000 oil palm seedlings (1.5 years old) were available through the Pará State Secretary of Agriculture (***SAGRI*** [***Secretaria do Estado de Agricultura***]). Farmers were aware that this crop was grown at nearby Pará Oil Palm Corporation (***DENPASA*** [***Dendê do Pará S.A.***]) plantation, where a modern processing factory had been operating since 1968. They were, however, reluctant at first to plant oil palm because of the seven years' wait before full harvest. Ōhashi related how, before he immigrated to Tomé-Açu in 1929, his 78-year-old neighbor in Japan was planting pine (*Pinus densiflora*) seedlings for his grandchildren. In 1981, the Paraense Agricultural Coop founded the North Brazil Oil Palm Company (***CODENPA*** [***Companhia de Dendê Norte Brasileiro Ltda.***]) for oil processing. In 1982, another factory was established by seven associates of the Paraense Agricultural Coop as the Santo Antônio do Tauá Oil Palm Company (***DENTAUÁ*** [***Dendê do Tauá Ltda.***]). Financial incentive programs of the Superintendency for the Development of the Amazon (***SUDAM*** [***Superintendência do Desenvolvimento da Amazônia***]) propelled Pará to become Brazil's largest oil palm producing state by the late 1980s. The Japanese-Brazilian contribution to this output increased to 30 percent by the mid 1990s. The

Paraense Agricultural Coop alone produced 23,510 t of oil palm fruits and 4,514 t of palm oil in 1994 (Governo do Estado do Pará 1995). [Han-Amazônia Nippaku Kyōkai 1984, Nikkei Colônia 1988, Kokusai Kyōryoku Jigyōdan 1988a, Han-Amazônia Nippaku Kyōkai 1994, Personal observations]

Acerola (*Malpighia glabra*) production reached commercial levels in 1984 at Castanhal. In 1980 Teruo Shimomaebara (1938-) at Castanhal, the son of Mitsuji Shimomaebara (1914-94), acquired seedlings from ***INATAM*** at Daini Tomé-Açu. This vitamin-C rich fruit was first exported to Japan by the Amazônica Agricultural Coop (***COPAMA***) and the *Nichirei* Corporation. Demand from domestic and the US markets then increased, making acerola a popular crop throughout tropical and sub-tropical Brazil. [Kokusai Kyōryoku Jigyōdan 1988a, Han-Amazônia Nippaku Kyōkai 1994, Personal observations]

Fruits such as lime, orange, guava (*Psidium guayava*), mammee apple or abricó (*Mammea americana*), etc., have also been test planted by individuals. ***INATAM*** was a good source of cash crop information for enterprising farmers, equipped with a demonstration farm (see Table 3-14) and a dedicated staff of extension specialists. Among its activities are its support of the Friends of Agriculture Associations (*Nōyūkai*) of Daini Tomé-Açu (expanded to Tomé-Açu) and Acará. In these associations producers worked together at

improving agricultural techniques and promoting crop introductions: new black pepper varieties, brazilnut, mahogany (*Swietenia macrophylla*), oil palm, cupuaçu, mangosteen, avocado (*Persea americana*), and even pisciculture and hog farming. [Daini Tomé-Açu Ijūchi Nijūnenshi Henshū Iinkai 1984, Personal communications and observations]

Katsutoshi Watanabe (1945-) of Daini Tomé-Açu pioneered cupuaçu comercialization beginning in 1978. He marketed scissor-extracted frozen fruit pulp to Belém. A smaller, processed frozen product helped overcoming transportation problems from the interior. According to Homma (1996), the Tomé-Açu region (Tomé-Açu, Acará, Moju, and Concórdia do Pará) had 2,519 ha of cupuaçu plantations by 1995. In contrast, there were 5,897 ha of cupuaçu plantations in all of Pará State. The Tomé-Açu region's annual cupuaçu production was 2,069,000 fruits, second only to the Marabá region, traditional area of forest-extracted cupuaçu, with 2,090,000 fruits in 1995. Marabá's total might still include a large portion of cupuaçu from the forest. [Watanabe 1996, Personal communications]

Tomé-Açu farmers have generally 'played second fiddle' to the pioneering agriculturists of the ***Zona Bragantina***, following their lead. Because of poorly maintained public road networks, product options have been limited in

Tomé-Açu to dried black pepper, cacao, guaraná, latex rubber, and hardy passionfruit. The unstable prices of these products disillusioned farmers or, in some cases, made them more speculative. They required local processing facilities for tropical fruit juice and pulp, or palm oil, and this required sums of capital beyond their reach. [Mori 1993, Tanaka 1996, Personal communications]

The cassava project of Saburō Chiba

Saburō Chiba (1894-1979; elected to House of Representatives 1925-30 and 1949-76; president of Tokyo University of Agriculture 1955-59) noticed that cassava had potential as an alternative to black pepper, and planned to build a starch plant at Tomé-Açu. His original idea was to make starch production an Amazonian export industry, to supplement the food and fodder needs of the world. He visited Belém with Japan's deputy prime minister, Takeo Fukuda (1905-95; prime minister 1976-78), and came to Tomé-Açu by himself in August of 1975. Experimental cassava culture had previously been tried on Okinawa's Ishigaki Island, using introduced varieties from Taiwan. In March of 1976 Chiba invited the president Elias Sefer of Federal Agricultural College of Pará (***FCAP*** [***Faculdade de Ciências Agrárias do Pará***]) to attend a seminar on cassava in Tōkyō, and to also see the experimental cassava plots in Okinawa. Chiba again traveled to Belém in April of 1976, to explain

his cassava pellet production scheme to the Pará state government. The International Cassava Food & Fodder Development Association (*Kokusai Mandioca Shokushiryō Kaihatsu Kyōkai*) was founded in Tōkyō in July of 1976. However, Chiba's interest quickly shifted to alternative fuels to replace gasoline, in the wake of US President Jimmy Carter's (1924- ; term 1977-81) April 19, 1977 announcement concerning future limitations of the global petroleum supply. He renamed the former association the International Cassava Energy Development Association (*Kokusai Mandioca Energy Kaihatsu Kyōkai*) in May of 1978. That year missions from the Japan International Cooperation Agency (JICA = *Kokusai Kyōryoku Jigyōdan*), from the new association, and Chiba himself visited Belém and Tomé-Açu to do surveys and project planning. The finance company International Mandioca Development Corporation (*Kokusai Mandioca Kaihatsu Kabushiki Gaisha*) was established in June of 1979, under the chairmanship of Saburō Chiba and president Kenji Nakanishi (1908- ; president of Takasago Essence Industry Corporation). The company had issued capital resources of ¥ 190,000,000 (US$ 858,253) within the authorized capital of ¥ 500,000,000 (US$ 2,258,560). A local counterpart company, the Pará Cassava Corporation (***COPAMASA*** [***Companhia Paraense de Mandioca S.A.***]) was formed in Belém in August of 1979. Tanio Oshikiri (***CAMTA*** president 1957-69 and 1973-78;

director 1978-79) was appointed its president, having issued capital Cr$ 4,230,000 (≈ US$ 153,000) within the authorized capital of Cr$ 30,000,000 (≈ US$ 1,084,000). [Chiba 1975, Chiba 1977, Nakanishi 1980, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985]

An experiment station with processing facility (45 ha) was opened at Arraia District of Tomé-Açu in November 1979. Of 130 cassava varieties planted there, 20 varieties were selected in 1980. A cassava flour factory and a farm (430 ha) began their operations in June of 1982. Pará state informally consented to transfer 18,000 ha of land to the company. However, Saburō Chiba died in Mexico City in November of 1979, while on a mission commemorating the 50th anniversary of Japanese immigration to the Amazon. On this occasion, the Arraia-Mariquita road of Quatro Bocas leading to the ***COPAMASA*** factory was named Avenida Saburô Chiba. Nobusuke Kishi (1896-1987; prime minister 1957-60) took over chairmanship of the International Cassava Energy Development Association, and attempted to make this effort into a bilateral Japanese-Brazilian project. Despite his political efforts, the project failed after a short time. This was because the cost of cassava was greater than that of sugarcane for purposes of alcohol production. Tomé-Açu farmers also preferred to plant oil palm to fill their vacant black pepper fields, rather than a soil-depleting

tuber crop. The cassava factory was closed in June of 1984, and ***COPAMASA*** was dissolved in August of 1986. [Nakanishi 1980, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Oshikiri 1981-83, Personal communications]

The Post-***JAMIC*** and Post-***JEMIS*** Period

Before the closures of Japan Migration and Colonization Ltd. (***JAMIC***) and Japan Emigration Service Financial Assistance Corporation (***JEMIS***) on September 30, 1981 (see Chapter 1), ***JAMIC*** mediated the merger of the Tomé-Açu Agricultural Promotion Commission (***COFATA***) with the Daini Tomé-Açu Agricultural Assistance and Promotion Association (***ASPRO***). The new Tomé-Açu Agricultural Promotion Association (***ASFATA*** [***Associação Fomento Agrícola de Tomé-Açu***] = *Tomé-Açu Nōson Shinkō Kyōkai*) was thus incorporated on August 7, 1981. ***INATAM*** still continued to operate until 1986, when it was donated to ***EMBRAPA-CPATU***. JICA continued to be a major foreign donor to ***CPATU***, in the form of various joint research projects. [Kokusai Kyōryoku Jigyōdan 1988a, Tomé-Açu Nōson Shinkō Kyōkai 1992]

Brazil entered a long economic depression from 1978 to 1982. This was a result of the second oil crisis, which was itself initiated by the December 1978 Islamic revolution in Iran. All agricultural products suffered from flat markets, a severe blow to farmers and their cooperatives. In 1982,

CAMTA borrowed money from a Brazilian bank through a US$ face value contract, at a time when there was little black pepper stock for export to secure repayment. At this time of stagflation, depreciation of Cr$ directly increased the deficit of the cooperative. Ishibashi (1986) argued that this financial crisis was caused by **CAMTA**'s policy of making easy advances for products without regulations. In other words, its members misunderstood the cooperative to be a 'welfare organization.' Auditors finally suspended the US$ loans, and **CAMTA**'s management was reshuffled. [Kokusai Kyōryoku Jigyōdan 1988a, Personal communications]

The new board's president, Yoshiyuki Uesugi (1939- ; term July 1983-April 1992), and the managing director, Kōzaburō Mineshita (1939- ; term July 1983-April 1992; then president until March of 1997), took strong measures to recover fixed liabilities. Some farmers were forced to sell lands or machinery to repay the cooperative. In 1984, even **CAMTA** liquidated most of its immovable properties at Quatro Bocas other than its headquartes for repaying debts. The **CAMTA** warehouses at Castanhal and Ananindeua, and its old offices and pier in Belém were also sold. This increased capital reserves of the cooperative. In that year, **CAMTA** was also able to collect 100 percent of the predicted black pepper harvest of its members for cooperative sale. The outstanding deficit was compulsorily assigned to members, in

proportion with the cooperative utilization of each. This skewed assignment of cooperative debt frustrated large producers. They argued that incompetent farmers had caused the crisis borrowing to cover living expenses, while producing little for the cooperative and diverting products to middlemen (for little quality control and quicker cash). The ***CAMTA*** management objected that large producers could not have grown without cooperative finance in proportion with their farm size. [Ishibashi 1986, Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1985, Tanaka 1995]

During 1984-85 period, 66 members left the cooperative, not counting deaths. Although the national economy started recovering in 1983, ***CAMTA*** still did not have enough funds to finance agricultural production. JICA saw this as a threat to the Daini Tomé-Açu community, as the potential collapse of ***CAMTA*** could lead to destructive consequences for the entire settlement. Based on a special mission ('Ogura Mission') report in 1984, JICA requested that ***Banco America do Sul*** (*Nanbei Ginkō*, which succeeded the fund of ***JEMIS***) provide emergency financing to ***CAMTA***, on the condition that ***CAMTA***'s capital reserves would increase. The first installment of Cr$ 945,000,000 was loaned on October 25, 1984, while the second Cr$ 1,589,050,000 loan was released on December 26, 1984 (together equalling ¥ 250,000,000 = US$ 1,047,471). Then in May of 1985, a production increase loan

of Cr$ 3,800,000,000 (exchange of ¥ 250,000,000 = US$ 1,063,513) was awarded to 141 cooperative members. Attracted by these finance opportunities, and with encouragement from JICA, 27 people joined ***CAMTA*** in 1985. These events generated lasting animosity between cooperative members and those who had seceded from it. [Kokusai Kyōryoku Jigyōdan 1988a, Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1985, Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1986, Tanaka 1995, Personal communications]

From 1985 through the first half of 1988, black pepper prices were above US$ 4,000/t, that surpassed US$ 9,000/t in 1987. This pepper boom caused some farmers to retrogress to monoculture, until they again witnessed the market collapse. Some Castanhal people had already returned to Japan for jobs (*dekasegi* = ***dekassegui***; temporarily working away from home) to reconstruct their personal finances by 1987. The number of these trips to Japan for work peaked as the black pepper boom ended in 1989. Many of these sojourning workers were joined by ***nissei*** Japanese-Brazilians. The Japanese government legalized the permanent resident status of *nisei*, *sansei* (third generationers), and their immediate family members in June of 1990. Demand from Japan's industrial sector compelled the government to do this. The Han-Amazônia Nippaku Kyōkai (1994) reported that by March of 1992 about 2,015 ***dekassegui*** people from the Amazon were in

Japan, of which 1,300 came from Pará including 350 of Tomé-Açu. The most popular job among Tomé-Açu housewives in Japan was caregiving at hospitals or retirement homes, where they earned US$ 3,000-4,000/month. This income was transferred to Brazil, where it helped husbands farming at home, and children studying in the cities. However, a number of ***nissei*** students quit school to join the ***dekassegui***, having become discouraged by a series of teacher strikes and hyperinflation, which indefinitely delayed their graduation. [Mori 1993, Tanaka 1996, Han-Amazônia Nippaku Kyōkai 1996, Nippaku Mainichi Shinbum 1997, Personal Communications]

JICA pursued a 10-year reconstruction plan for Tomé-Açu (*Tomé-Açu Saiken Jukkanen Keikaku*) beginning in 1984. The plan focused on development of rural infrastructure. JICA donated heavy machinery to ***ASFATA*** to maintain road systems at the settlement. JICA also encouraged the initiatives of ***nissei*** farmers, and helped organize the Tomé-Açu Electrification and Rural Telephone Cooperative (***COERTA*** [***Cooperativa de Eletrificação e Telefonia Rural da Região Geoeconômica de Tomé-Açu Ltda.***] = *Tomé-Açu Nōson Denka Denwa Kumiai*) on October 7, 1987. Its president, (Jorge) Shigueo Takahashi (1951- ; term 1987-) got the support of young ***nissei*** board members to electrify the entire settlement by 1989. By 1993 they had also built the first rural telephone

system of Pará, with matching-fund financing equal to their capital, and subsidies from JICA and the State of Pará. [Tomé-Açu Bunka Kyōkai 1995, Personal communications]

The Amazônia Hospital Tomé-Açu Branch Hospital (***Hospital Amazônia de Quatro Bocas*** = *Enkyō Jūjiro Byōin*: a subsidiary of Amazônia Japanese-Brazilian Beneficence Society) was founded on June 28, 1987 (inaugurated in 1988). This hospital took over the former ***JAMIC*** clinic at Daini Tomé-Açu. It was supported by Japanese and Brazilian associates, with equipment donations and staff training provided by JICA. It opened its doors to the general public thanks to cost-sharing conventions with the Municipality of Tomé-Açu and private firms. [Tomé-Açu Bunka Kyōkai 1995, Personal communications]

JICA also subsidized the construction and operational functions of the ***ASFATA*** juice factory, a project that had been pending among Tomé-Açu farmers for 10 years. The experimental factory had a freezing capacity of 40 t/month and was completed at Agua Branca in 1987. Construction was subsidized with US$ 200,000 from ***ASFATA***, and US$ 270,000 from JICA. In February of 1991, ***ASFATA*** leased this juice factory to ***CAMTA***. The cooperative borrowed about US$ 1,000,000 from the Constitutional Fund for Financing the Northern Region (***FNO*** [***Fundo Constitutional de Financiamento do Norte***]), through the Amazônia Bank (***BASA*** [***Banco da***

Amazônia]), to enhance the factory's freezing capacity to 150 t/month. [Tomé-Açu Bunka Kyōkai 1995, Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1995b]

Black pepper market prices fell to US$ 800/t in July of 1992, far below its production cost of US$ 2,000/t. Since that year, fruit juice (passionfruit, acerola, cupuaçu, etc.) production has contributed more than 50 percent of cooperative members' agricultural incomes. The fruit juice orders jumped thanks to a broadcast about ***CAMTA***'s acerola juice on Brazil's ***TV Globo*** in March of 1992. In 1993-95 JICA provided subsidies totalling US$ 1,080,000 for a laboratory, boiler, sterilizer, and a freezer. With an additional US$ 80,000 investment from the cooperative, the factory attained a juice processing and freezing capacity of 300-400 t/month. However, due to rapid acerola production increase in Brazil, ***CAMTA*** faced severe competition and a flat market of frozen acerola juice (US$ 880/t in December 1993). In 1993, the juice factory had to stop receiving acerola fruits from producers in August and November. To be competitive in the market, ***CAMTA*** was urged to improve acerola varieties for higher sugar and vitamin-C contents. With ***ATEA*** extension help, interested cooperative members conducted selection and propagation of acerola trees by grafting. This effort yielded the highly productive 'Inada Variety' and vitamin-C rich 'Takamatsu (Monami) Variety.'

ATEA also planned to improve vitamin-C content of acerola juice by adding camu-camu (*Myrciaria dubia*) fruits. They introduced this species to Tomé-Açu from the National Research Institute of the Amazon (***INPA*** [***Instituto National de Pesquisas da Amazônia***]) in Manaus in 1993. ***CAMTA*** began replanting members' farms with new acerola cultivars beginning in February of 1994. In May of 1994, frozen 100 ml juice packages, marketed with the original cooperative brand name, appeared in Belém supermarkets. [Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1993, 1994, and 1995a, Tanaka 1996]

However, ***CAMTA*** (1995a) reported that cooperative management was difficult during this period due to a flat product market, poor government agricultural policies (i.e., lack of financing), and a dependence on ***dekassegui*** paychecks from abroad. These factors together reduced cooperative members' production. Tanaka (1996) corroborated this production slump with a graph showing that average cooperative sales during 1990-93 fell to only one-forth of 1980s sales. This was primarily due to the slump in the black pepper market. Worsening this situation was a decreasing rate of cooperative black pepper marketing compared to Tomé-Açu's total production, from 32.7 percent in 1987 to 22.7 percent in 1991. In 1994, ***CAMTA*** marketed only 320 t of black pepper, while a single producer and middleman at Quatro Bocas named Tetsushi Nagai (1952- ; who

seceded from the cooperative in 1985) sold 600 t. Moreover, off-farm income from 1989 to 1993 accounted for more than 35 percent of average total income, a three-fold jump over the 1980-86 period. This growth in off-farm receipts was due to infusions of ***dekassegui*** wages from Japan. [Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1995a, Tanaka 1996]

In July of 1994 ***CAMTA*** closed its São Paulo branch and its cooperative market at Quatro Bocas, and leased them to individuals (***'terceirização'***), primarily former employees or cooperative members. The cooperative's Belém branch was closed in July of 1995, and a former employee took it over as a contract agent. The cooperative's fertilizer shop, gas station, repair shop, accounting section, and ***ATEA*** were all leased out via ***'terceirização'*** in May of 1996. The cooperative's management operations moved to the juice factory at Agua Branca, vacating the cooperative's original headquarters at Quatro Bocas. Personnel cuts reduced the number of employees from 100 (45 staff and 55 laborers) in 1995 to 57 (53 staff and 4 laborers) in 1996. The cooperative's Education Committee (***CATES*** [***Comissão de Assistendia Técnica Educacional e Saúde***] = *Kyōiku Iinkai*) that had published ***CAMTA***'s monthly paper, the cooperative district councilor (***delegado*** = *hyōgiin*), and product inspector (***fiscal de produtos*** = *kensain*) were all abolished. On the other hand, ***CAMTA*** invited its ex-associates, who were

still shipping fruits to the ***ASFATA*** juice factory leased to ***CAMTA***, to rejoin the cooperative. This turned out to be unsuccessful. [Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1995a, 1996, and 1997]

Broadcasts on ***TV Cultura*** in 1995, and ***TV Globo*** (program '***Globo Rural***') in 1996 made Tomé-Açu nationally famous for its tropical fruit juice. However, competition for raw juice products was becoming fierce. Large, non-associate farmers and middlemen opened domestic juice factories, enticing cooperative members with immediate cash for their raw juice materials. Thus finding itself short of raw material at the juice factory, ***CAMTA*** purchased 95.5 t of cupuaçu from Marabá during February and March of 1995. In July of 1996 ***CAMTA*** also purchased pineapple from Marajó, açai from Cametá, and other minor fruits. The cooperative then approached the public Company for Technical Assistance and Rural Extension of Pará State (***EMATER-PA*** [***Empresa de Assistênsia Técnica e Extenção Rural do Estado do Pará***]) to propose the introduction of tropical fruit cultivation to rural Brazilians. Mature fruits would be sold to the juice factory. Passionfruit was selected for initial extension planting, because of its easy cultivation, stable market, and quick earning potential. [Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1995a, 1996, and 1997, Personal communications]

At this juncture, the final ***issei*** management of ***CAMTA*** resigned en masse in March of 1997. The cooperative reconstruction was left to its new president, Jorge Itō (1955-), and its new managing director, Francisco Wataru Sakaguchi (1960-). [Cooperativa Agrícola Mista de Tomé-Açu 1997]

Summary

Agricultural development of the Amazon was initiated with cacao cultivation by Portuguese settlers near Belém in the late 17th century. Cotton was introduced there in the late 18th century, followed by rice and sugarcane during the late 19th century. However, plantation culture declined due to the rubber boom, which began in the late 19th century and ended in the early 20th century. The Amazonian regional economy collapsed after the rubber boom. The states of Pará and Amazonas then sought investment, including infusions of foreign capital, offering large land concessions in return. The US government dispatched a rubber survey mission there for its automotive industry. This resulted in the establishment of the Ford Project in 1928, endowed with 1,500,000 ha of forest land concession in Pará State. The Japanese government was initially interested in cotton production, and new regions to receive Japanese immigrants beyond Brazil's southern states. This led to ambitious

forest land concession projects like: the Amazon Enterprise Corporation (25,000 ha) started in Amazonas in 1928, the Japanese Plantation Company of Brazil (1,385,000 ha) started in Pará in 1929, the Amazon Industry Corporation (1,000,000 ha) started in Amazonas in 1930, and the Yoshio Yamada project (26,000 ha) started in Pará in 1931. Most projects were unsuccessful in terms of settlement development. However, jute introduced in floodplain (***varzea***) areas by the Amazon Industry Corporation, and black pepper introduced on the upland (***terra firme***) by the Japanese Plantation Company of Brazil became two major Amazonian export crops. Brazil became one of the five largest global producers of each of these crops. These achievements resulted from persistent agricultural efforts of Japanese immigrants, isolated in Amazonian forests throughout World War II. Immigrant agricultural cooperatives undermined the exploitative ***'aviado'*** system, which had been a chronic hindrance to rural development in the Amazon. Nevertheless, extensive monoculture of black pepper led to the outbreak of *Fusarium*, and made farmers vulnerable to regional and global market fluctuations. Experiencing such crises, the immigrant farmers remembered the original idea of their leaders, that was to establish stable settlement agriculture with 'permanent' (perennial and tree) crop species. Their quest for alternative crops to black pepper leads to the

development of agroforestry systems at Tomé-Açu and other Japanese settlements in the Amazon (see Chapter 4).

CHAPTER 4
JAPANESE AGROFORESTRY DEVELOPMENT IN THE AMAZON

Introduction

This chapter first discusses the evolution of intensive land use systems in East Asia, focusing on Japan from the time of the Portuguese arrival through the National Seclusion Period discussed in Chapter 2. Seminal policies of domain (*han*) administrators, and the publications of agricultural scholars (*nōgakusha*) and 'master farmers' (*rōnō*) are reviewed. Tree species that were promoted to achieve self-sufficiency, long-term income generation, and soil saving/flood control are listed. After the Meiji Restoration (see Chapter 2), the roles of master farmers and subsequent 'diligent and creative farmers' (*tokunō*) in the process of agricultural modernization are discussed. Education programs for modern Japanese farmers (including emigrants), intended to produce *tokunō* with a cooperative orientation, are reviewed. Finally, Japanese agroforestry development in the Brazilian Amazon, and institutional arrangements that have supported its development, are summarized and analyzed.

Intensive Agriculture and Agroforestry Development in Japan

Community-Regulated Intensive Agriculture in East Asia

East-Asian agriculture has evolved around paddy rice (*Oryza sativa*) as the staple food of the region's population. Political authority in small regional domains as well as the historic Chinese dynasties rose out of the necessity to control paddy irrigation, and depended upon surplus rice production to feed soldiers and bureaucrats. According to a Chinese proverb, whoever commands the Yellow River (and thus irrigation) rules China. Thus agriculture, represented by rice cultivation, had long been considered the foundation of a state in monsoonal East Asia.

Paddy rice productivity responded to labor intensification. Improvements in agricultural technology also helped maximize paddy land productivity. The end product was an agricultural system that made continuous cropping on one plot possible. Intensive rice production practices were therefore able to support an ever-increasing East Asian population using limited arable resources. East Asia's humid monsoon climate also influenced the evolution of upland cultivation, favoring labor-intensive intertillage for higher productivity (even though continuous upland cropping was detrimental to soil fertility).

Iinuma (1978) cited a 30-year study of Japanese dairy farming which concluded that 0.1 hectare (ha) of land was sufficient to feed one dairy cow. In contrast, Iinuma argued, even 1-2 ha of land would be insufficient to sustain a cow if the land were managed extensively, especially without proper weeding. Iinuma noted that agriculture evolved a fallowing system in drier climates with less vigorous vegetative growth (and fewer weeds), such as in Germany. There it might be difficult to sustain a dairy cow with less than 1 ha of land, even using intensive management. It was not as difficult to do the same with 1-2 ha of land, using extensive management, and this is the mode European cattle development adopted.

European settlers arrived in the New World, then, with a background of extensive agricultural practices. In the New World, extensive plantation agriculture and cattle ranching were feasible, due to a relatively unlimited supply of inexpensive land and labor, including slavery, and later, the availability of large machinery. In Asia by contrast, from the time of the earliest Chinese book on agricultural practices, *Qímín Yāoshù* (written by Sīxíe Gŭ (?-?) between 532-545 A.D.), small-scale intensive cultivation was repeatedly recommended as a better practice than large-scale extensive agriculture. The influential agricultural policy

textbook *Nóngzhèng Quánshū* of Guāngqǐ Xú (1562-1633), published in 1639, similarly supported intensive farming practices. The oldest Japanese textbook of agriculture (*nōsho*) is the *Shinmin Kangetsushū*, or book seven of *Seiryōki*, written by Mizuya Doi (?-1654) between 1629-54. It promoted modest-scale cropping, in which farmers could apply sufficient care. Conversely, it rejected extensive-scale planting, considering it ruinous management. The *Nōgyō Zensho*, popular *nōsho* of Yasusada Miyazaki (1623-97) published in 1697, supported the idea of small-scale intensive agriculture, and cited the *Nóngzhèng Quánshū*. [Iinuma 1978, Furushima et al. 1980]

When the first nationwide cadastral land survey (*Taikō Kenchi*) was conducted in Japan from 1582 into the 1590s by the warlord Hideyoshi Toyotomi (1537-98), independent small producers (*hon-byakushō*) were given title to their land holdings. At the same time the power of taxation possessed by traditional land owners (*shōen ryōshu*: e.g., aristocrats, shrines, temples, and their local agents) was revoked. In principle, each plot of land belonged thereafter to a single farmer, who was obligated to pay tax to his single lord of the domain (*han*) where he resided. For example, Hideyoshi Toyotomi ruled all domain lords of Japan, but taxed only farmers within his own fiefdom. Ieyasu Tokugawa (1543-1616;

Shōgun 1603-05), the founder of Tokugawa Shogunate (1603-1867), and his successors followed suit. Taxation rates were high: about 60 percent of agricultural production was taxed initially, leaving farmers barely enough resources for subsistence (Ōishi 1980).

The Tokugawa Shogunate compelled farmers to work hard through various decrees and penalties, but also with some incentives. Farmers were bonded to their lands, and moving away from one's lands was forbidden (though many did flee when tax burdens became too heavy). Land tax was normally imposed on a per harvest basis of the season's main crop (usually rice), allowing farmers the latitude to withhold untaxed surplus yields generated through management intensification. Intensification included technological and soil improvements to increase harvests, as well as multiple and off-season cropping. Some domain lords encouraged commercial crops, including various tree species in upland fields. However, they could not control and tax this production effectively. From the mid-17th century until the early 18th century, the real tax rate dropped to less than 30 percent. The tax rate was raised again after the 1720s, and remained at about 35 percent thereafter. [Ōishi 1980]

Hard working farmers developed a strong attachment to their farmlands over generations. This attachment was

reinforced by strong ties to one's rural community (*mura*). The community furnished its members with regulations concerning irrigation, green manure harvesting from communal forests or grasslands (*iriaichi*), joint tax liability (*goningumi*), mutual financial aid (*tanomoshi* or *mujin*), and free labor exchanges (*yui*) during transplanting, harvest, and ceremonial occasions. About 80 percent of all Japanese under the Tokugawa Shogunate were farmers. These farmers were the ancestors of the majority of Japan's population after modernization.

The multipurpose agricultural cooperatives (*Sangyō Kumiai*) authorized by the Meiji Government in 1900, served as rural credit unions, and sales and purchasing cooperatives. Thus, cooperative farming unions had their origins in traditional '*mura*' societies.

Production Increases, Population Growth, Forest Degradation and Reforestation

According to Ōishi (1980), the area of Japanese rice fields increased historically as follows: 862,000 ha around 930 A.D; 946,000 ha around 1450; 1,635,000 ha by 1600; and 2,970,000 ha around 1720. The rapid increase of rice fields after the 16th century was due to the advent of strong feudal samurai authorities, equipped with improved civil engineering technologies. Formerly marginal lands, such as

flood plains, deltas and slopes were converted into paddy fields by the construction of river banks, land reclamation, terracing, irrigation, and drainage. The growing population utilized more resources from forests to sustain their lives, and to fertilize rice paddies. Increased rice production surpluses enabled samurai rulers to construct castles, temples, shrines and trading ships. These all required large volumes of lumber from natural forests to construct. Frequent fires in cities resulted in the need to fell more trees to reconstruct urban areas. All this tree felling led to degraded forests ('*tsukiyama*'), which caused soil erosion, flooding, drought, and disputes over forest usufruct.

The actual scale of deforestation of that period is not clear without reliable statistics. The following recent figures of the Japanese Ministry of Agriculture, Forestry and Fishery provides a clue. In 1990, out of 37,769,000 ha of Japan's land area, 10,212,000 ha (27.0%) were tree plantations and 13,378,000 ha (35.4%) were natural forests, while a total of 25,105,000 ha (66.5%) were registered under the 'forest' land category (Nōrinsuisanshō Tōkeijōhōbu 1997). Over two thirds of Japan is occupied by mountainous terrain, while alluvial plains occupy only 13% (Kōdansha 1993). Most mountains are covered by the forests, and the

most forests are on the mountains (thus '*yama*' means 'mountain' and 'forest' in Japanese). The 'natural forests' in the cited statistics include primary and secondary forests, while the primary forests remain only in high mountains and religious sanctuaries (Miyawaki 1970). 'Tree plantations' are planted on the slopes with relatively convenient access from the mountain villages. The previous natural forests there had been most heavily exploited by the villagers. They harvested firewood, charcoal and various non-timber products for subsistence and sale, besides timber assignments for the ruling authorities.

Japanese reforestation projects actually began in the 16th century. A civil engineer named Kyūhaku Ōya (1521-79) constructed irrigation canals to supply water to 1,100 ha of new paddy fields, while he developed 64 ha of upland fields in what is today Tatebayashi City, Gunma Prefecture. There he planted 1,500,000 matsu (*Pinus densiflora*) wild seedlings over 519 ha of barren land from 1559 to 1578 (this site became a national forest after the Meiji Restoration in 1868). Beginning around 1600, a feudal lord of what is today Tottori Prefecture, Korenori Kamei (1557-1612) purchased seedlings of sugi (*Cryptomeria japonica*) from today's Kagoshima prefecture, and planted them on over 200 ha on Mt. Jūbō (921 m; this became a national forest after

the Meiji Restoration). He also published the list 'Trees People Should Not Freely Cut' (*Muramura Kirazaru Ki*) in 1596, to promote local industries of silk, paper, wood/bamboo work, lacquer ware, oil, spice, and fruits. The list of trees included: kuwa (*Morus bombycis*), kōzo (*Broussonetia kazinoki*), urushi (*Rhus trichocarpa*), tsubaki (*Camellia japonica*), ganpi (*Wikstroemia sikokiana*), chinai (*Styrax japonica*), kiri (*Paulownia tomentosa*), asakai (*Machilus thunbergii or Cinnamomum japonicum*), kaki (*Diospyros kaki*), sanshō (*Zanthoxylum piperitum*), kaya (*Torreya nucifera*), kuri (*Castanea crenata*), and take (*Phyllostachys* spp.). A samurai named Rindayū Awano (?-1661) developed upland fields in what is today Iwata City, Shizuoka Prefecture, and planted matsu, sugi, and hinoki (*Chamaecyparis obtusa*) nursery seedlings on 372 ha there from 1614 to 1622. [Makino 1988, Shikano Chōshi Henshū Iinkai 1992, Personal communications]

The Tokugawa Shogunate demarcated important forests for its direct control, and ordered reforestation through its local magistrates in 1642. Forest guards were appointed, and a databank ('*Ohayashichō*') was created for each forest site that included: location, area, species, age, number, distance to Edo (today's Tōkyō) and Ōsaka, and the means of timber transportation to markets. [Makino 1988]

Domain lords established their own forests from the early to mid-17th century. There tree harvesting was strictly regulated according to various forest classifications. Natural regeneration was practiced in some forests by allowing farmers to harvest non-target species (e.g., as in today's Kiso National Forest of Nagoya Domain), and by allowing 15- to 20-year rotational cutting of fuelwood species and 50- to 60-year cutting cycles for timber species (e.g., the *Banguriyama* System in the Tosa Domain). Share contracts (*bubunrin*) were adopted in the domains of Hitoyoshi (today's Kumamoto Prefecture), Obi (Miyazaki Prefecture), Usuki (Ōita Prefecture), Kagoshima (Kagoshima Prefecture) and Morioka (Iwate Prefecture), in which local lords and farmers divided tree harvests proportionally. In such reforestation projects, several years of intercropping of upland short-term crops between the rows of tree saplings, called '*kibasaku* (tree field cropping)' or '*kirikaebata* (shifting field),' were commonly used (Satō, Tai. 1983). This taungya system compensated farmers for land preparation and weeding tasks, and the crops also suppressed weeds. During the Edo Period, other domains such as Okayama (today's Okayama Prefecture), Tsugaru (Aomori Prefecture), and Akita (Akita Prefecture) also produced notable reforestation administrators. [Makino 1988]

The minister (*Sanshikan*) of the Rūkyū Kingdom (today's Okinawa Prefecture), On Sai (alias Bunjaku Gushichan; 1682-1761; term 1728-52) wrote the 'Eight Books of Forestry Administration' ('*Rinsei Hassho*.' 1737-51; the last book was added in 1869), which included a complete set of Okinawan forest laws, as well as natural forest management and reforestation techniques. He presented criteria for the identification of successional stages of forests from a remote view of canopies, in order to determine appropriate management methods and reforestation requirements. Topography, humidity, temperature, wind (especially typhoon occurrence) and light were discussed with respect to reforestation, with attention to the proper combination of shade tolerant and intolerant trees. Species recommended for local reforestation were: sugi, Shina-aburagiri (*Aleurites fordii*), Rūkyū-matsu (*Pinus luchuensis*), Okinawa-urajiro-gashi (*Quercus miyagii*), inumaki (*Podocarpus macrophyllus*), mokkoku (*Ternstroemia gymnanthera*), iju (*Schima liukiuensis*) and take (bamboo spp.). On Sai also systematically designed the pre-World War II Okinawan vegetative landscape to have thick windbreak forests, protection forests against storm surges, and roadside trees. Trees such as fukugi (*Garcinia subelliptica*) and deigo (*Erythrina variegata* var. *orientalis*) were planted for these

purposes. [Sai 1976, Makino 1988, Personal communications and observations]

The lord of the Yonezawa Domain (today's Yamagata Prefecture), Harunori Uesugi (alias Yōzan Uesugi: 1751-1822), was famous nationwide for his administrative reforms and agricultural development. His initiatives became a model for the Kansei Reform (1787-93) of the Tokugawa Shogunate, and his life and words were taught in moral studies classes at public schools after the Meiji Restoration. [Makino 1988, Personal communications]

The Yōzan administration was characterized by sumptuary edicts, construction of grain reserves against famine, subsidies for raising children, agricultural finance, construction of river banks and irrigation canals, promotion of horses for transportation and fertilizer production, opening of schools, etc. Farmers in the Yonezawa Domain were assigned to plant the 'three most important trees' (*Sanboku*), i.e., kuwa, kōzo, and urushi, until one million of each species had been planted. Advanced technologies to process silk, paper, and lacquer ware were indroduced by the Domain lord. Another 12 tree species were also recommended: matsu, sugi, hi (*Chamaecyparis obtusa*), kusamaki (*Podocarpus macrophyllus*), kiri, shioji (*Fraxinus spaethiana*), kuri, kaki, cha (*Camellia sinensis*), yanagi (*Salix* spp.), hannoki

(*Alnus japonica*), and take (bamboo spp.). For understory of these trees, udo (*Aralia cordata*), kikubaōren (*Coptis japonica* var. *japonica*), and other medicinal species were promoted. Additionally, farmers were advised to plant edible trees and herbs (leaf, fruit and root) as hedges and in homegardens, such as himeukogi (*Acanthopanax sieboldianus*), ume (*Prunus mume*) and momo (*Prunus persica*). Himeukogi hedges are the symbol of today's Yonezawa City, where people make *tempura* of its young leaves. Yōzan Uesugi published an edible wild plant guidebook, 'Food' (*Katemono*) in 1802, illustrating how to cook 80 some species, and distributed 1,575 copies to village leaders in Yonezawa Domain. During the Tenpō Famine (1833-36), when 200-300 thousand peole died in Japan, it was said only Yonezawa Domain did not have a single death from starvation. [Sugihara 1898, Makino 1988, Kōdansha 1993, Personal communications]

Toward the end of Edo Period, reforestation became more popular among Japanese. A forest administrator named Takao Kyōno (1790-1862) of Kurobane Domain (today's Tochigi Prefecture) wrote 'The Favor of Rich Forest' ('*Tazan-no-Sachi*' or '*Futoyama-no-Sachi*') in 1849. The text explained tree plantation techniques for sugi and hinoki. He wrote that it would not be easy for a family to secure decent lives over generations without making special endeavors.

However, greed could lead to deviation from human morals. Hence, he stressed that reforestation should be encouraged as a legacy to one's descendants. Terunori Genrokurō Furuhashi (1813-92), the resourceful village head of Mikawa (Aichi Prefecture), stressed reforestation in a similar way, but he also emphasized mutual prosperity at the level of community. During the Tenpō Famine (1833-37), he saved farmers from starvation by negotiating with the Shogunate magistrate. In 1835, he persuaded villagers to plant sugi and hinoki on community-owned land to prepare for future famines. [Furuhashi 1976, Makino 1988]

After the chaotic experiences of the opening of Japan and the Meiji Restoration, Furuhashi decided again in 1881 to plant a community forest of sugi and hinoki. The project began in 1886 and involved 650 village families, to whom the Furuhashi Family paid wages for tree planting and maintenance. In a signed contract, each family promised to plant 100 trees annually for 100 years, and to sell no trees for the first 100 years. In 1884, Furuhashi wrote 'The Shortcut for Contributing to the Nation' ('*Hōkoku Hayamichi*'), and 'Seeding for a Rich Nation' ('*Fukoku no Tanemaki*'), in which he encouraged hill people to plant trees as a way of participating in the modernization of Japan. Furuhashi's work was also presented in moral study

textbooks in schools nationwide. [Furuhashi 1976, Makino 1988, Personal observations]

Rōnō Initiatives to Modernize Agriculture and Forestry

From the mid 17th century, commercial agriculture became popular among farmers. Numerous agricultural textbooks (*nōsho*) were published by agricultural scholars (*nōgakusha*) and master farmers (*rōnō*), illustrating the cultivation and processing of trees and herbaceous crops (Table 4-1). Volume 1, chapter 10 of the *Nōgyō Zensho*, '*Sanrin no Sōron*' was an introduction to forestry. It cited a classic Chinese work on politics called the *Guǎnzǐ Quánxiūbiān*, by Zhòng Guǎn (?-645 B.C.), which stated that the basis for a 10-year administrative planning was to plant trees. Acording to the author of *Nōgyō Zensho*, Yasusada Miyazaki (1623-97), fast growing Japanese trees like sugi, hi, mastu (*Pinus* spp.), kiri, and kashi (*Quercus* spp.) would yield small timbers after ten years if planted in fertile soil. Fuelwood species could be harvested within half a decade. The 'four most important tree species' (*Shiboku*), kuwa, urushi, cha, and kōzo, would start producing within 5 years. This might also apply to grafted fruit trees, such as kaki, nashi (*Pyrus pyrifolia*), momo, and kuri. Miyazaki recommended that trees be planted on the northwestern

Table 4-1. Tree and herb species used in agroforestry, as cited in the agricultural textbooks (*Nōsho*) of Edo Period

Category	Species
Hyakushō Denki (ca. 1682-83), author unknown*1	
trees fortifying river banks*2	yanagi (*Salix gracilistyla*, *S. gilgiana*, *S. koriyanagi*, and *S. integra*), medake (*Pleioblastus simonii*), kuchinashi (*Gardenia jasminoides*)
Nōgyō Zensho (1697) by Yasusada Miyazaki (1623-97)*3	
Shiboku Sansō - 4 important trees and 3 important herbs	cha (*Camellia sinensis*), kōzo (*Broussonetia kazinoki*), urushi (*Rhus verniciflua*), kuwa (*Morus bombycis*) asa (*Cannabis sativa*), ai (*Polygonum tinctorium*), benibana (*Carthamus tinctorius*)
Kaboku - fruit trees	sumomo (*Prunus salicina*), ume (*Prunus mume*), anzu (*Prunus armeniaca*), nashi (*Pyrus pyrifolia*), kuri (*Castanea crenata*), hashibami (*Corylus heterophylla* var. *thunbergii*), kaki (*Diospyros kaki* var. *sylvestris*), zakuro (*Punica granatum*), yusuraume (*Prunus tomentosa*), yamamomo (*Myrica rubra*), momo (*Prunus persica*), biwa (*Eriobotrya japonica*), budō (*Vitis coignetiae*), ichō (*Ginkgo biloba*), kaya (*Torreya nucifera*), mikan (*Citrus unshiu*), kunenbo (*Citrus nobilis*), yuzu (*Citrus junos*), kōji (*Citrus tachibana*), bushukan (*Citrus medica*), kinkan (*Fortunella japonica*), natsumikan (*Citrus natsudaidai*), buntan or zabon (*Citrus grandis*), suikōji (*Citrus sudachi*), sanshō (*Zanthoxylum piperitum*)
Shoboku - various useful trees	matsu (*Pinus densiflora*, *P. thunbergii*, *P. koraiensis*, *P. parviflora*), sugi (*Cryptomeria japonica*), hinoki (*Chamaecyparis obtusa*), kiri (*Paulownia tomentosa*), shuro (*Trachycarpus fortunei*), kashi (*Quercus gilva*, *Q. hondae*, *Q. sessilifolia*, *Q. myrsinaefolia*, *Q. acuta*, *Q. salicina*, *Q. glauca*), shii (*Castanopsis cuspidata*, *C. cuspidata* var. *sieboldii*), sakura (*Prunus jamasakura*, *P. sargentii*, *P. lannesiana* var. *speciosa*, *P. leveilleana*), yanagi (*Salix subfragilis*, *S. babylonica*, *S. sachalinensis*, *S. pet-susu*, *S. bakko*, *Toisusu urbaniana*), shiraki (*Sapium japonicum*), hannoki (*Alnus japonica*), tsubaki (*Camellia japonica*), take (*Phyllostachys pubescens*, *P. aurea*, *P. bambusoides*, *P. nigra* var. *henonis*, *P. nigra* var. *nigra*, *Pseudosasa japonica* var. *japonica*, *Pleioblastus simonii*, *Chimonobambusa marmorea*)
Yakushu - medicinal plants	tōki (*Angelica acutiloba*), jiō (*Rehmannia glutinosa*), senkyū (*Cnidium officinale*), daiō (*Rheum officinale*), botan (*Paeonia suffruticosa*), shakuyaku (*Paeonia lactiflora*), kankyō (*Zingiber officinale*), uikyō (*Foeniculum vulgare*), kengoshi (*Ipomoea hederacea*), sanyaku (*Dioscorea japonica*), tenmondō (*Asparagus cochinchinensis*), himashi (*Ricinus communis*), byakushi (*Angelica anomala*), shiso (*Perilla frutescens*), hakka (*Mentha arvensis*), tōkishi (*Malva verticillata*), keigai (*Nepeta japonica*), kōju (*Elsholtzia cristata*), takusha (*Alisma plantago-aquatica*), bakumondō (*Liriope spicata*), mokuzoku (*Equisetum hyemale*)
Kōeki Kokusankō (1859) by Nagatsune Ōkura (1768-1859)*4	
listed tree species with cultivation methods	sugi (*Cryptomeria japonica*), hi (*Chamaecyparis obtusa*), matsu (*Pinus densiflora*, *P. thunbergii*, *P. koraiensis*, *P. parviflora*), kuri (*Castanea crenata*), kaki (*Diospyros kaki* var. *sylvestris*), kōzo (*Broussonetia kazinoki*), mitsumata (*Edgeworthia chrysantha*), haze (*Rhus succedanea*), nikkei (*Cinnamomum japonicum*, *C. sieboldii*), cha (*Camellia sinensis*), ume (*Prunus mume*), budō (*Vitis coignetiae*), nashi (*Pyrus pyrifolia*), mikan (*Citrus unshiu*, etc.)

Category	Species
Kōeki Kokusankō (1859) cont.	
other listed trees and agroforestry products	urushi (*Rhus verniciflua*), kiri (*Paulownia tomentosa*), gobushi (*Rhus semialata*), kōboku (*Magnolia obovata*), shuro (*Trachycarpus fortunei*), kuzu (*Pueraria lobata*), warabi (*Pteridium aquilinum*), tokoro (*Dioscorea japonica, D. tokoro*), karasuuri (*Trichosanthes cucumeroides*), kikarasuuri (*Trichosanthes kirilowii* var. *japonica*), murasaki (*Lithospermum erythrorhizon*), ai (*Polygonum tinctorium*), o (*Boehmeria niponoivea* var. *concolar*), tōki (*Angelica acutiloba*), senkyū (*Cnidium officinale*), shakuyaku (*Paeonia lactiflora*), shiitake (*Lentinus edodes*), kikurage (*Auricularia auricula*), bukuryō (*Poria cocos*), kohaku (amber), hachimitsu (honey)

*[1] Nihon Nōsho Zenshū vol.16/17 (1979)
*[2] Small trees were recommended. Hannoki (*Alnus japonica*) was cited inferior to yanagi for this purpose. Kuchinashi was said to keep moles away from the river banks.
*[3] Miyazaki (1978)
*[4] Ōkura (1978)

boundaries of farms and homegardens. There they would block cold winds and preserve warm energy (*qi*) from the southeast, aiding both crop growth and human health. Trees would also prevent the spread of fire across neighbors' farms, and hinder thieves from tresspassing. Branches and leaves could be used as firewood, trunks from thinnings as timber, and fallen leaves as fertilizer. It was noted as worthwhile to plant good trees when constructing a new house, to prepare for home repairs in the future. [Miyazaki 1978, Furushima et al. 1980]

Second, Miyazaki mentioned community forestry, stating that twice as many trees should be planted to replace those felled at each annual harvest. He stressed that villagers should decide the dates for joint tree cutting and planting.

If reforestation was carried out each year before the rice planting season, trees and bamboo would grow steadily, providing copious materials for construction of sluices, ponds and river banks. Planted trees would also furnish sufficient fuelwood for cooking, and warmth in winter. Thus, people would remain healthy and work hard, bringing happinness to their families. As in the old proverb "well fed, well bred," people would become gentle and far-sighted in making their life plans. [Miyazaki 1978]

Third, Miyazaki commented on the benefits of the '*Shiboku*' and other useful trees to the nation's economy. They would provide employment for craftsmen and merchants. Even the aged, weak, disabled, and solitary could find auxiliary work, avoiding the tragedy of famine in old age. In remote locations, tree products could compensate for the transportation costs and animal damage associated with grain crops, making silviculture a viable economic alternative. As cited in *Huòzhíchuán* of *Shǐji*, the first Chinese official history written by Qiān Sīmǎ (145 or 135 B.C.-?), different regions in ancient China were famous for their products from tree crops, and the wealth of people who had planted many trees and bamboos was immeasureable. A similar situation was observed in Japan of Miyazaki's era. He concluded by emphasizing the importance of arboreal crop species as

second only to that of staple grains. He also stressed the need to develop long-term forest management plans. [Miyazaki 1978]

The tradition of intensive agriculture and forestry, as well as the agricultural studies of master farmers (*rōnō*) were passed down to the Meiji Era (1868-1912), the age of rapid modernization and primary industrial production (see Chapter 2). The new Meiji government initially tried to westernize Japanese agriculture, as well as manufacturing industry, and hired teachers from England and Germany. Some US instructors were invited to Hokkaidō for developing frontier settlements. However, students at the newly established Japanese universities were not satisfied taking courses that had little relevance to Japanese agriculture, especially paddy farming. Extensive Western methods did not prove superior to conventional farming methods, which were already adapted to local climate, soil, geography and the system of land ownership. Therefore, from the late 1870s through the 1890s, government officials and university scholars turned to empirical *rōnō* farming. [Iinuma 1978, Uchida 1991]

Japan's first industrial revolution in the 1880s generated an urgent need for increased food production, especially rice, for the growing urban population. During

this period, eminent *rōnō* became active like Naozō Nakamura (1819-82), Senji Nara (1822-92), Enri Hayashi (1831-1906), Denjihei Funatsu (1832-98), and Rikinosuke Ishikawa (1845-1915). [Iinuma 1978, Kokushi Daijiten Henshū Iinkai 1979-93]

Naozō Nakamura (1819-82) defended the interests of small tenant farmers. He measured farming fields in 12 villages of Nara Prefecture, where the cropped area had been overestimated in the Edo Period. Thanks to his initiative, local farmers gained tax relief from the new Meiji government. Nakamura believed that misery among small farmers could be alleviated through increased productivity. He went on to develop 742 rice and 27 cotton varieties that were demonstrated at the second National Industrial Exhibition (*Naikoku Kangyō Hakurankai*) in 1881. [Kokushi Daijiten Henshū Iinkai 1979-93, Uchida 1991]

Enri Hayashi (1831-1906) established the private *Kannōsha* Institute (1883-99) to diffuse his rice cultivation techniques nationwide. He was dispatched by the Meiji government to 11 European countries, the US, and China during 1889-90. On his return, he advocated that Japan's independence should be secured by increasing agricultural production. Hayashi found that Japan was agriculturally endowed with better soil and climate than any country he had

visited. [Kokushi Daijiten Henshū Iinkai 1979-93, Uchida 1991]

Denjihei Funatsu (1832-98) was well known for his reforestation of a 400 ha watershed protection forest in his own Fujimi Village, Gunma Prefecture. He became one of the first instructors (term 1878-86) at *Komaba Nōgakkō* (today's Faculty of Agriculture at the University of Tokyo), teaching Japanese-style rice cropping and upland cultivation. He advocated a new agriculture that combined the merits of both traditional and introduced Western practices (*Kondō Nōhō*). Funatsu was hired by the Ministry of Agriculture and Commerce as an expert on tree crops and sericulture (term 1886-98). [Kokushi Daijiten Henshū Iinkai 1979-93, Makino 1988]

Nakamura, Hayashi, Funatsu, and other famous *rōnō* of this period were dispatched by the Meiji government, or invited by prefectural authorities, to give lectures, field training, crop improvement advice, and promote new cultivation technologies. The government encouraged motivated farmers to organize regional and national agricultural study meetings (*Shūdankai* or *Nōdankai*), in which they could exchange ideas and crop variety seeds, while interacting with eminent *rōnō* farmers. [Kokushi Daijiten Henshū Iinkai 1979-93, Makino 1988, Uchida 1991]

Meanwhile, university agriculture graduates at national research and extension institutes were trying to systematize *rōnō* agriculture with the help of German scientific theories. The most advanced rice cultivation practices of the day, those of the Fukuoka region, were chosen as the model for modern Japanese agronomy. The '*tokunō*' farmers became extension vehicles for the adoption and modification of the new technologies emanating from modern agricultural research institutes. In consequence, leadership by the *rōnō* master farmers gradually waned. But in rural Japanese communities there survived the agricultural legacy of these *rōnō* masters among '*tokunō*' farmers: professional discipline, intuitive and careful observation of nature, and a subjective mind capable of innovation and positive change. [Iinuma 1978, Kokushi Daijiten Henshū Iinkai 1979-93, Uchida 1991, Personal communications]

Training of *Tokunō* Farmers, Cooperativism, and Diversified Farm Management

In spite of the advent of new agricultural technologies for many crops, Japanese farmers owning only one hectare per family continued to suffer from poverty. A series of economic depressions led to the dissolution of social strata among farmers, with many of them falling into tenancy (see Chapter 2). This situation worried some national leaders

who recognized small independent farmers as the backbone of the nation (the idea called agrarianism or *Nōhonshugi*).

Beginning in 1904 the Danish national reconstruction model, employed after the wars of Slesvig-Holstein (1848-50 and 1864), was brought to Japan. The Folkehøjskole (Folk or National High School) Movement of Nicolai Frederik Severin Grundtvig (1783-1872), Christen Kold (1816-70), and others influenced the establishment of National High Schools (*Kokumin Kōtō Gakkō*) in Japan. The Japanese movement was headed up by the Yamagata Prefecture Autonomy Training School (*Yamagata-ken Jichi Kōshūjo*) in 1915. Private and public institutions commonly called Farmer Training Centers (*Nōmin Dōjō*), including National High Schools, flourished all over the country during the 1920s and 1930s. Among these were emigration schools for disinherited farmers: i.e., rural youths who were not first-born. Such emigration schools were a direct consequence of a 1925 national policy espousing overseas emigration. Locally specialized institutes for emigrants headed for the Amazon were operated by Hisae Sakiyama (1875-1941) and Tsukasa Uetsuka (1890-1978). Uetsuka was also known for his 1923 introductory book about Danish agricultural cooperatives. [Ishikawa 1936, Hollman 1936, Porter etd. 1969, Pedersen etd. 1977, Noguchi 1990]

The objective of Farmer Training Centers (*Nōmin Dōjō*) was to produce disciplined *tokunō* farmers who would take the leadership in any rural society, whether in Japan or in Japanese settlements overseas. The Centers also stressed overcoming adversity through diligent effort, diversified farming training, and modern cooperative formation. Apart from the Danish models, the life of Kinjirō Ninomiya (alias Sontoku Ninomiya; 1787-1856) was often cited as a model of ethical virtue, worthy of emulation. Ninomiya had been an accomplished *rōnō* and agricultural philosopher, serving under the Tokugawa Shogunate. He advocated sincerity, diligence, frugality, and cooperation, and taught farmers to 'repay virture (*hōtoku*)' they received from heaven, man and earth. He founded the first Japanese rural credit union, called *Hōtokusha*. Ninomiya's idea was succeeded by his followers' *Hōtoku* Movement, that set the basis for the modern agrarianism (*Nōhonshugi*) of Japan. Ninomiya's statues of children, reading books while carrying firewood on their backs, were set up at public elementary schools all over Japan. [Ishikawa 1936, Kōdansha 1993, Personal observations]

The religious traditions of Shintōism, Confusianism, and Christianity were all present among the Centers. One of these was an influential Christian school led by Toyohiko

Kagawa (1888-1960), who had advocated Tri-Dimensional (3-D) Agriculture (*Rittai Nōgyō*) since 1925. The 3-D Agriculture stressed efficient use of farmland by combining annual crops, tree crops, and small domestic animals/insects. This contrasted with the traditional paddy-upland 'bi-dimensional' farming that seemed incapable of relieving Japanese farmers' privations. The origins of this 3-D concept reside in the geography of Japan, where arable land for rice and upland crops had been historically limited to only 16 percent of the archipelago. Remaining lands were occupied by steeply sloped forests. Influenced by Western fruit tree literature and the biblical idea of Eden, Kagawa reviewed traditional intercropping methods, such as annual crop planting between rows of another annual crop, young orchard and timber trees, and lopped deciduous kuwa trees in winter (Yamada, Mi. 1991).

Kagawa and Fujisaki (1935) stressed the bounty of forest trees from ancient times, bearing fruits and nuts for humans when harvests failed, providing feed for pigs and honey bees, producing wood and fuel, and attracting fish ashore. A particular example included the planting of trees, such as nitrogen-fixing hannoki on paddy bunds. It provided shade for farmers and draft animals, and also served as supports for drying rice bundles. Statesmen from

as early as the Nara Period (710-94 A.D.) encouraged farmers to plant trees in yards and along hedges as sources of edible nuts, fruits, and young leaves in case of famine. Kagawa and Fujisaki (1935) also recommended homegarden enrichment with more tree species and small domestic animals. In upland fields 3-D mixed planting (*konshoku*) was suggested as a means to 'overyielding,' the simultaneous production of 75 percent of a primary crop and 75 percent of a companion crop compared to single cropping. An example of this was cited from Nagano Prefecture, where 20-30 kurumi (*Juglans regia* var. *orientis*) trees were planted per hectare of kuwa used in sericulture. Due to the complexity of production technology and workforce distribution in such practices, the authors emphasized the importance of production unions (*Sangyō Kumiai*), through which farmers could cooperate to overcome challenges.

Immigrant Japanese Farm Diversification in Brazil and a Search for More Sustainable Land Management

In response to the coffee market collapse of the 1930s, Shūhei Uetsuka (1876-1936) advocated diversified farming among Japanese immigrants in São Paulo, Brazil (Kita 1986). Uetsuka was the leader of the Kasato-maru immigrants in 1908, and a cousin of Tsukasa Uetsuka (1890-1978). His plan was to promote small-scale farm processing based on

commercial crops like rice, beans, cotton, castor bean, cassava, peanut, potato, tomato, and the raising of pigs, cows, goats, chickens, ducks, rabbits, and angoras. Fast-growing trees like Bracatinga (*Mimosa scabrella*) and Eucalipto (*Eucalyptus* spp.) were also recommended as sources of railroad ties, fuelwood and paper.

Toyohiko Kagawa visited Brazil in 1953, and lectured about agricultural cooperative formation and 3-D Farming (Agro Nascente 1996a). He covered 8,600 km from the Southern States to the Amazon, and gave 161 lectures during his three month stay (Paulista Shinbunsha 1996). Seiichi Fujisaki also made various trips to Japanese settlements, including Tomé-Açu in 1981 (Daini Tomé-Açu Nōyūkai 1982). While the ideas of Shūhei Uetsuka, Kagawa and Fujisaki were broadly accepted, their application was limited. This was due to the presence of Brazil's vast underdeveloped lands, always available for occupancy. However, if frontiers disappeared, their practices could be useful in rehabilitating degraded soils in existing fields.

Agro Nascente (1996a), a popular agricultural magazine among Japanese immigrants in Brazil, described an example of 3-D Agriculture in China. It introduced Qiānyānzhōu in subtropical Jiāngxī Province, where an integrated project of reforestation, orchards, pasture, ponds for paddy rice,

piggeries and pisciculture rehabilitated the impoverished rural village. Contemporary Japanese-Brazilian agricultural leaders are therefore expressing a willingness to review their past recklessness and "get rich quick" attitudes. They seek more stable farming models, with a hope that their children would be attracted to agriculture. Lessons from previous Japanese farming experiences, as well as from established German and Dutch immigrant communities in southern Brazil are being carefully studied. Soil conservation and labor rationalization have become priorities, not just short-term profit. Agroforestry systems (***systemas agroflorestais***) and no-till cropping (***plantio direto***) are gaining popularity, and are showing some promise (Fukami 1996).

Due to historical experiences in Japan as have been described, Japanese immigrants in Brazil were presumably ready to exercise their traditional skills (i.e., diversified intensive farming, crop and cropping system improvement, reforestation, etc.), once they settled down by group and faced limitations of local land supply. Masami Oshikiri (1925-), former chairman of the Cultural Association of Tomé-Açu (***ACTA;*** term 1984-94) provided with the following comments (1997):

> "I was raised in a mountain village of Yamagata Prefecture. Our homeland was known for Yōzan Uesugi,

the first National High School, and persevering people in the cold and snowy climate of Northeastern Japan (*Tōhoku Chihō*). However, we still needed to emigrate because of poverty. The *tokunō* immigrants of Yamagata, such as Tomoji Katō, Tanio Oshikiri, and Haruo Ōnuma led Tomé-Açu agriculture and community. I do not think, though, we are special among Japanese farmers. We only practiced what we could imagine, by remembering how our parents and grandparents did at home. Their hard work, intensive land use, and reforestation of marginal lands for grandchildren are common features all over Japan. There farmers had strong attachment to tiny lots handed down by generations, for which 'sustainable' management was a norm. After we immigrants were adapted to local agriculture with tropical crops, we tried to modify our traditional farm ideas in enhanced scales."

Adaptation to the Amazon

Efforts of Early Immigrants

In 1924, when immigration projects first began in the Amazon (see Chapter 3), the Japanese had limited experience in tropical agriculture. The Ryūkyū Kingdom (today's Okinawa Prefecture) which was conquered in 1609 by the Satsuma Domain (today's Kagoshima Prefecture), did have a traditional sugarcane industry. Yet it was only after the Sino-Japanese War (1894-95) that the Japanese attempted full-scale sub-tropical agriculture in their new territory of Taiwan. Some Japanese ventured into plantation operations in today's Southeast Asian countries, learning from the examples of European colonists. There were also agricultural engineers like Jūichi Ikushima (1892-1969), who

came to Brazil after working in tropical Asia (Ikushima 1959). The reality of the Amazon, however, was still unknown to most contemporary Japanese.

The Fukuhara Mission Report, published by the Ministry of Foreign Affairs in 1927, contained the first direct information to Japanese about neotropical agriculture and forestry. This mission visited Brazilian farmers and saw that their small homegardens and fields were planted with rubber, cacao, coffee, tobacco, sugarcare, cotton, cassava, rice, corn, and beans. The mission's forester, Seiitsu Ishihara, described the rubber tree as sensitive to soil conditions, citing the failed plantation of Acará's mayor. Cacao trees were observed to be planted under canopies of matamata (*Eschweilera matamata*), cassio (*Cryptocaria guianensis*), breu (*Protium* spp.), and macacauba (*Platymiscium ulei*) trees in lowlands. The report recommended that tree species should be planted as minor crops because: 1) midday tropical heat would be intolerable for Japanese working in direct sunlight, 2) harvest of tree crops could be managed by women and children, 3) tree crops would make good use of lowlands inappropriate for major crops, and 4) tree crops would be an additional source of income. Concerning natural forests, Ishihara noted that timber available in the area targeted for conversion to

farms could be fully utilized for settlement construction, while surplus lumber might be sold to Belém. However, he proposed tree felling restrictions: 1) a 50-120 m wide strip of riverside forest should be set aside to protect banks and water sources that would secure river transportation (the misfortune caused by drained rivers in Hokkaidō's development was not to be repeated); 2) protection of forests on slopes to prevent landslides, to produce domestic fuelwood and provide a timber supply by selective cutting (conversion to pasture was discouraged), 3) all species forbidden by Pará State Decree 1567 (October 30, 1916), i.e. andiroba (*Carapa guianensis*), castanheiro (*Bertholletia* spp.), seringueira (*Hevea brasiliensis*), and palmeira (palms). The Japanese Plantation Company of Brazil followed this advice, and left forests intact along the Acará-Mirim River and its tributaries, the Igarapé Ipitinga River and Igarapé Arraia River (note: 'igarapé' means small river). Ironically, forests that had been designated areas of restricted felling remained unlotted and untitled. This ultimately made them attractive targets for Brazilian ranchers, who almost completely converted them to pasture since the 1980s. [Fukuhara et al. 1927, Ishihara 1927, Personal communications and observations]

Fukuhara anticipated a future scarcity of wood resources and ordered Ikushima to establish a nursery for plantation experiments, an activity that preceded initiatives by Brazilian research institutes (see Chapter 3). About 200 brazilnut trees planted during this period still survive in Tomé-Açu (147 were counted on Japanese-Brazilian farms in 1996). However, the effort's target crop, cacao, failed completely due to insufficient technical studies. A lack of shade-trees was listed as the major cause of failure (see Chapter 3).

When the Japanese Plantation Company of Brazil was closed during World War II, its last manager, Renkichi Hiraga (1902-85), a forestry graduate of the University of Tokyo, remained at Tomé-Açu. He dedicated himself to searching for perennial tropical crops. Fujii (1955) noted that Hiraga's farm looked like a private experiment station, having 4,000 sisal hemp, 5 casca preciosa (*Aniba canelilla*), 8 clove, and other trees. This predisposition for perennial crops, which the Japanese called 'permanent crops' (*einen-sakumotsu*), was similar in Amazonas State. Hisae Sakiyama (1875-1941) commented to Fujii (1955) in 1939 that he settled in Maués because of its guaraná. There immigrant farmers could work under the shade of guaraná grove in the

heat of the Amazon. Sakiyama expressed his future goal of planting rubber trees and pau rosa (*Aniba rosaeodora*).

At Parintins, the Amazon Industry Research Institute of Tsukasa Uetsuka (1890-1978) planted brazilnut, guaraná, cacao, and coffee with upland rice. There, Ryōta Oyama (1882-1972) wrote in February of 1934 that agriculture in the Amazon differed from the Japanese experience in terms of its extensiveness (Noguchi 1993). While waiting for a harvest from perennial crops (4-8 years), rice could be intercropped for only two years because of quickly deteriorating soil fertility. Hence, slash and burn operations of primary and secondary forests had to be repeated every year to create new rice fields. This led to ever expanding perennial plantations without intercropping after the second and final year of rice culture. Under conditions of resource limitations, Oyama concluded, it was not viable to take care of widely scattered, still unproductive tree crops. [Noguchi 1993]

To address this soil fertility related issue, Tsukasa Uetsuka ordered testing of green manures and organic composting in November of 1934. At the same time, a mixed-planting project involving rubber tree and coffee was started on the second company farm. The third company farm also had a new rubber plantation (7,000 trees on 35 ha) by

March of 1935. That month, Ryōta Oyama wrote about his 20 year farming plan that included coffee, cacao, rubber tree, guaraná, and brazilnut, together with short-term crops like upland rice, cassava, and jute. He also expressed keen interest in planting timber species like cedro. [Noguchi 1993]

Post-World War II Farm Planning

According to Ikushima (1960-a), Amazonian agriculture remained underdeveloped in the years following World War II. Brazilian farmers practiced only conventional swidden farming (***roça***) while commercial crop cultivation was limited to jute. Jute had been introduced by Japanese in floodplain (***varzea***) lowlands. To stabilize immigrants' economic lives and establish sustainable farm production, Ikushima recommended a more diversified approach.

Diversified farming could optimize benefits through efficient use of land and labor, spread economic risk, and yield an efficient operational use of funds. Nevertheless, disorganized introduction of additional crops could overload family labor resources, decrease work efficiency, reduce soil fertility, and even increase costs. The latter situation could lead to speculative farm management, or perhaps do no more than broaden a farming family's diet.

Short-term crops would be easier to introduce, but entail risks of wild price fluctuations. Permanent crops, in contrast, might command relatively stable market prices, but only after the 5-10 year wait for them to mature. Once a crop had been proven profitable, like black pepper, everyone would plant it until, ultimately, its market would collapse. Farmers would then be faced with difficult crop conversion challenges. Therefore, Ikushima recommended intercropping combinations of several short-term and permanent crops to spread risk, efficiently allocate labor, and minimize idle lands. He defined such mixed-planting as the temporary overlapping of different crop life forms, or the transitory stage in which short-term and permanent cropping coincide. He noted that organization and management of this complex successional stage of cropping would naturally lead to optimal and sustainable profit for farmers. Ikushima proposed the following five development models for family farms, depending on geographic conditions (Table 4-2). [Ikushima 1960-a]

Ikushima (1960-b) observed that forests in the ***Zona Bragantina*** and at accessible locations along rivers had been indiscriminately felled for wood resources and to make way for agricultural developments. Such deforestation might cause climate and precipitation changes, soil erosion, and

Table 4-2. Immigrant farm development models for the Amazon

Year	Crop Category and Area				
<Suburban Farm; 15 ha lot>					
	Homegarden	Vegetables	Animals	Grains, etc.*[1]	Tree crops
1st	1 ha	2 ha	2 ha		
2nd				5 ha	
3rd-					5 ha
	house, flowers fruits: papaya, mango, banana, citrus, avogado, pineapple	Rotation 1)-4) 1) leaf veg. 2) fruit veg. 3) beans 4) long-term sp.	some hundred hens, 3 pigs, 1 cow w/quicuio and gordura grasses	Rotation rice malva soy bean peanut (later pasture)	Intercropping black pepper*[2] coffee rubber tree brazilnut
	note: Vegetables 1) lettuce, collard, parsley, green onion, mustard; 2) cucumber, bell pepper, okra, chayote, egg plant, maxixe; 3) haricot bean, feijão da corda; 4) cabbage, onion, tomato, beet, pumpkin, water melon, melon				
<Upland (*Terra Firme*) Farm; 25 ha lot>					
	Homegarden	Short-term sp.	Intercropping Perennial sp.	Tree species	
1st	1 ha	(5 ha)	(5 ha)	5 ha	note: (ha) = intercropped area of a year
2nd		(5 ha)	(8 ha)	3 ha	
3rd		(5 ha)	(11 ha)	3 ha	
4th		(5 ha)	(14 ha)	3 ha	
5th		(5 ha)	(17 ha)	3 ha	
6th		(5 ha)	(20 ha)	3 ha	
7th		4 ha			
	house, fruits, vegetables, hens	corn, feijão bean peanut, sesame malva, herbal cotton tobacco	cassava, castor bean, banana, sisal, cotton, sugarcane, pineapple, pasture	rubber tree, coffee, cacao, guaraná, black pepper*[2], coconut, oil palm, babaçu, brazilnut, paradise nut, cumaru, nutmeg, tea, clove, timber trees	
<Upland Grassland (*Campo*) Farm; 50 ha lot>					
	Pasture		note: mechanical farming; fattening of lean cattle from Goias and Mato Grosso; 2 cattle per hectare		
1st	20 ha				
2nd	20 ha				
3rd	10 ha				
<Floodplain (*Varzea*) Farm; 25 ha lot including 5 ha forest reserve>					
	Homegarden, Vegetables, Animals (Upland = *Terra Firme* portion of a lot laid perpendicular to river)		Paddy Rice*[1] (Flood Plain = *Varzea*)	Rubber, Cacao (Natural Bank = *Restinga*)	Trees, etc. (Upland = *Terra Firme*)
1st	3 ha				
2nd			5 ha		
3rd				2 ha	
4th					5 ha
5th-					5 ha
	house, self supply crops, fruits, vegetables, hens		paddy rice	rubber, cacao (short-term sp. intercropped)	wood / grasses erosion control & silvopastril
<Floodplain (*Varzea*) Grassland Farm; 25 ha lot>*[3]					
	Misc. crops	Pasture	Industrial crop		
1st	5 ha fruits, grain, vegetables, etc.	10 ha	10 ha sugarcane or jute	note: 3-4 year rotation of pasture and sugarcane; several cattle per hectare	

Source: Ikushima (1960-a). A lot is usually a rectangular slip of land with a depth of 1 km and variable frontage (in this table, 150 m, 250 m, and 500 m).

Table 4-2--continued
*[1] collectively operated by agricultural cooperatives with large farm machinery.
*[2] categorized as a tree crop in this list.
*[3] mechanized plantation settlement of sugarcane alcohol or jute fiber company.

local scarcities of timber and fuelwood. Reforestation at accessible locations might therefore become profitable after some 10 years when trees began to attain merchantable size. Ikushima recommended the following timber species: cedro vermelho (*Cedrela odorata*), acapu, freijó (*Cordia goeldiana*), louro (*Ocotea costulata*), pau amarelo (*Euxylophora paraensis*), marupá, maçaranduba (*Manilkara huberi*), macacauba, jacarandá roxo (*Macharium acutifolium*), itauba amarela (*Silvia itauba*), and angelim rajado (*Pithecelobium racemosum*).

Tomé-Açu Sangyō Kumiai = ***CAMTA*** (1961a) reported reduced precipitation in Tomé-Açu Town (***Cidade Tomé-Açu***) due to clear cutting. The agricultural cooperative recognized the importance of forest for three additional reasons: 1) to supply farmers with black pepper support stakes, fuelwood, and charcoal; 2) to produce leaf litter (measured to be 500 g/m^2 in December of 1934) and grasses for organic fertilizer; and 3) to comply with Forest Law 23793 (promulgated on January 23, 1951) restricting tree felling to less than 75 percent of forested land. Hence, ***CAMTA***

decided to limit forest conversion for farm fields to less than 18 ha within each 25 ha family lot. In each lot, 3 ha of black pepper (approximately 3,600 plants) and 6 ha of glasslands for field mulching needed to be growing by the 5th year of tenancy (Table 4-3).

Table 4-3. Typical 25 ha farm development plan for Tomé-Açu

Year	Home-garden*[1]	Black Pepper	Upland Rice → Cassava → Grass*[2]		
1st	1 ha				
2nd		1 ha	<2 ha>	<2 ha>	
3rd		1 ha	<2 ha>	<2 ha>	2 ha
4th		1 ha	<2 ha>	<2 ha>	2 ha
5th			<2 ha>	2 ha	2 ha
6th			<2 ha>	2 ha	
7th			2 ha	2 ha	
7th present	1 ha	3 ha	2 ha	6 ha	6 ha

Source: Tomé-Açu Sangyō Kumiai (1961a). In a 25 ha lot, 7 ha of forest was reserved. Rotation from new forest opening, upland rice, cassava, to grassland existed. Areas in < > were already harvested and converted to the next crop as of the 7th year.

*[1] house, warehouse, black pepper drying yard, vegetables, fruits, hens and pigs.

*[2] capim imperial (*Tripsacum laxum*), capim sapé (*Imperata brasiliensis*), capim santo (*Andropogon nardus*), and small bush trees were used for mulching and organic fertilizer of black pepper.

According to Izumi and Saitō (1954), farmers organized Black Pepper Study Group (*Pimenta Kenkyūkai*) meetings at the cooperative beginning in 1950. They competed among themselves to break the record for most black pepper production per plant. Riuemon Yokoyama (1924-), a life-time associate in honor of ***CAMTA***, recounted cultivation practices of those days (Yokoyama 1995). Black pepper was

planted at 2.5 m X 2.5 m spacing in January, at the beginning of the rainy season. He and other farmers applied organic fertilizers, such as castor bean cake, in fertilizer holes. Weeds of the black pepper field scraped up throughout the rainy season (December-June) were also buried with fertilizers. The fertilizer holes were dug clockwise around black pepper plants. Yokoyama additionally made compost, mixed lime with it, and piled mud over this mixture. When turning piles he added chemical fertilizer to them. A handcart of such compost was applied to each pepper plant. During dry seasons, he mulched the east side of black pepper plants with grass, which was turned into the soil the following rainy season. By applying this fertilization regimen, two-year-old plants could produce 0.7-1 kg of dry black pepper, third year plants 2-3 kg, and from the fourth year onwards yields of 5-6 kg of dry black pepper were possible. One of Yokoyama's brothers harvested 4 kg of dry black pepper from individual three-year-old plants after applying abundant fertilization. The record yield at Tomé-Açu was 8 kg of dry black pepper from individual mature plants (according to Fujii 1955, Haruo Ōnuma harvested 10 kg per plant). The record holder had ordered laborers to collect imbaúba (*Cecropia* spp.) trees from secondary forest, chop them up and mix them with lime,

and finally bury them in ditches between black pepper plants. Yokoyama noted that farmers were willing to do such intensive management because they expected long life (ca. 20 years) of the crop, and 1 kg of dried black pepper could pay up to 4 man-day wages.

The Decline of Black Pepper Culture and the Necessity of Farming System Readjustments

Though some early immigrant leaders had advocated sustainable agricultural practices along with the acceptance of Brazil as their new homeland, most immigrants had a 'get rich quick' mentality (see Chapter 2). Tomé-Açu Sangyō Kumiai (1961a) recognized this mentality as a problem during the first Black Diamond Boom (see Chapter 3), when quick wealth from black pepper turned cooperative members into 'parvenus.' In pursuing their dreams of wealth, many lacked the seriousness to consider the future welfare of their new settlement. Yet farmers conducted intensive management of relatively small fields before the *Fusarium solani* outbreak (Table 4-3 and Appendix A), that saved forest and land resources. However, as the black pepper market became more and more erratic and *Fusarium* annihilated extensive areas, black pepper culture became a gamble for farmers. Access to machinery and a higher shift of wages also helped to change the management preferences of producers. Expanding farm

scales from 10,000s to 100,000s of plants (1,200 plants per ha), reduced soil management, and greater chemical fertilizer inputs rendered black pepper unhealthy, making it more vulnerable to *Fusarium* and other diseases within 5 to 8 years of being planted.

Searching for 'disease-free' land for black pepper culture, many people left or opened branch farms away from Tomé-Açu. This exodus was accelerated by the heavy rains of 1974, and road construction in 1976. However, *Fusarium* caught up quickly with farmers running away, for they probably carried infected black pepper cuttings with them (see Chapter 3). Everyone, except a few large-scale speculators, was doomed, sooner or later, to seek alternative crops. An immigrant farmer named Kiyomi Satō (1928-) of Castanhal remembered that during this period he and everyone else had been attempting to make quick fortunes from agriculture (Satō, K. 1994). He moved from Tomé-Açu to Castanhal, and repeated such farming practice for decades that depleted soil and made crops sick with chemical fertilizers. He had 'lost sight of the real meaning of life.' Satō recognized Renkichi Hiraga (1902-85) of Tomé-Açu, Gen'ichirō Nakazawa (1907-84) of Sul Brasil Agricultural Cooperative Central Union (***Cooperativa Central Agrícola Sul Brasil***; Nakazawa assumed managing director

1939-73, and president 1973-84), and some agricultural experts sent by the Japan International Cooperation Agency (JICA) as the ones who finally instructed him about the 'basic morals and goals of a farmer's life.' They were to help create fertile soil for future generations. After that realization, his farm was reorganized around tree crops and small domestic animals, to facilitate the restoration of soil organic matter.

Farmers who decided, for various reasons, to remain at Tomé-Açu had to immediately restructure their management. Gen'ichirō Nakazawa wrote of his 1975 visit to an older schoolmate of his, Renkichi Hiraga (Nakazawa 1979). When questioned about viable crops that could follow black pepper culture, Hiraga replied unexpectedly that he would again plant black pepper after resting his fields for several years. At that time the old man had 5,000 healthy black pepper plants over eight years old, which he had fertilized by applying only grass. He asserted that *Fusarium* would spread quickly in soils poor in organic matter and rich in commercial fertilizers. This endorsed what Nakazawa had heard from farmers in Castanhal, namely that black pepper grown in soil rich in organic matter resisted disease infection. As proof, Nakazawa mentioned three enormous black pepper vines planted by Enji Saitō in 1939. They were

still vigorously growing in the homegarden of Saitō's son-in-law Tanio Oshikiri (1911-87), the president of ***CAMTA*** (terms 1957-69 and 1973-78). Nakazawa also wrote that if Hiraga's advice was followed, then the maintenance of 10,000 pepper vines (8.5 ha) might be the limit for a family-farm management unit, while fulfilling a family's economic requirements. In other words, tropical agriculture could not be done extensively, if the goal was to maintain a sufficient supply of organic matter in the soil.

Hiraga was by no means simply a promoter of black pepper culture. He persistently advocated diversified farming practices. In an interview with Agro-Nascente (1983), Hiraga referred to his interpretation of the 'Green Hell' (***Inferno Verde***) of Alberto Rangel.

> "The goddess of the Amazon would lavishly open the door of her treasury to people who truly love her, share fate with her, and rejoice in her development as the highest pleasure of life. One day, such people should arrive here. However, the Amazon could turn into a green hell and obstruct those who come to plunder."

Hiraga mentioned the ruinous state of the Amazon Basin after its plundering by Western nations. As for the Japanese immigrants, black pepper was given to them only after their final decision to settle there. Besides, half a century of struggle was needed before they understood the solution of forest farming (*Shinrin Nōgyō*), or agroforestry. Hiraga believed that agriculture should be realized on Mother Earth

through harmony with nature. He accounted at the interview with Agro-Nascente (1983):

> "Exploiting soil as a raw material would lead to natural resource depletion and pollution. Respect should be paid to the life of soil by keeping it arable forever. Farmers should not desert their lands but take care of them out of gratitude. For the grace of plants and animals on the living earth feeds and keeps all humans alive. Though farmers get no rest due to their work with living things, mother nature should create and provide for them in return for their efforts. Farmers in Japan have planted the same land for thousands of years. Keeping in mind the early days when Tomé-Açu had very little in terms of commodities, people should first establish subsistence farms near residence, producing the staple rice, grains, homegarden vegetables, and organic fertilizers like compost and manure. Soil fertility should be preserved by rotation of short-term crops such as vegetables, fiber crops, and herbs. When necessary, fertilizer from external sources (e.g. organic wastes) could be imported. Crop residues might be shared with neighbors, given to animals, or made into compost. Having provided for one's own needs, cash crops should be planted outside of the self-supply fields. The income would fund cultural improvement (e.g. education) of the settlement. Fruits and bushes like papaya, black pepper, cacao, mango (*Mangifera indica*), rubber tree, and oil crops could be mix-planted, to the extent that farmers could afford to give them four years of intensive care. Labor requirements would diminish as trees mature. Eventually, farmers could increase the number of commercial plants, according to a family's labor resources for harvesting. The outer boundary of a farm should be planted with high trees for windbreaks and disease prevention (airborne spore filters). These border trees could include: brazilnut, mahogany, jacarandá (*Macharium acutifolium*), acapu, pau rosa, and angelim rajado. Managing 50 ha (two 25 ha lots) in this manner would allow a farmer to cultivate the same land permanently, and even get back on his feet in the event of crop failure or natural disaster."

Agroforestry Development and Supporting Institutions (with Focus on Acará = Tomé-Açu Settlement)

The Japanese Plantation Company of Brazil and Early Tree Planting

The Japanese Plantation Company of Brazil laid the foundations of agroforestry practices from the start of its Amazonian settlement projects (see Chapter 3). Several pre-world war immigrants substantiated this during personal interviews at Tomé-Açu from 1995 to 1996. One, Torao Hidaka (1926-), remembered four freijó trees planted in his homegarden by the Company as an experiment (Hidaka 1996). His family was asked to pay careful attention to these trees. Hidaka saw many andiroba trees at the Açaizal Experiment Station, and sumauma trees planted at the Tomé-Açu wharf. Ryūichi Ebata (1928-) helped his father Ietoshi Ebata (1897-1969) transplant cacao seedlings at the Company's Extension Division (*Kannō-bu*) nursery (Ebata 1996). Ebata remembered that cedro, brazilnut, freijó, andiroba and rubber trees were planted by the Company.

Shirō Toda (1912- ; ***CAMTA*** managing director 1946-57; president 1946-47) received one year of training in making of a traditional Japanese paper (*Mino-Washi*) using tree fiber before coming to Brazil (Toda 1996). His training was part of the Company's plan for development of a paper industry. According to Toda, cacao was at first planted

without shade trees, but with wicker exclosures (***cerquilhas***). Later, brazilnut trees were inserted into cacao plantations at 20 m X 20 m spacings. These were supposedly for future export of brazilnuts to the United States. In Boa Vista District, each alternating lot (250 m frontage X 1,000 m in depth) was set aside as a windbreak forest where cacao was planted. On either side of the road connecting the Tomé-Açu wharf and Quatro Bocas (today's ***Avenida Governador Dionysio Bentes***), the Company planted a row of rubber trees fringed by two rows of cacao trees having 5 m spacing.

Tarō Tokuhashi (1911-) picked up wild seedlings of cedro branco (*Cedrela huberi*) sprouting around a parent stump after field burning (Tokuhashi 1996). A rural Brazilian had impressed him with the utility of this wood. He planted 1,800 saplings with 5 m X 5 m spacing after rice harvest in the rainy season of 1933-34. His friend, Mr. Sasaki, who immigrated on the same 1930 ship (*dōsensha*) with him, came to collect some of these seedlings. Kōzō Yoshida, chief of the Açaizal Experiment Station, visited Tokuhashi and also took some seedlings for himself. When planted in full sun, cedro branco trees were attacked by wood-boring beetles. Tokuhashi later learned from the same Brazilian that these trees are less prone to attack in secondary forests. While his cedro branco trees were growing into a

stand, Tokuhashi lost his mother and two elder brothers to malaria and became ill himself. Turning his lot over to Mitsuyo Maeda (Conde Koma; 1878-1941) in Belém, Tokuhashi moved to Vila Amazônia in 1938, coming in with his brother-in-law there. Tokuhashi planted jute in the flood plains until he was able to return to Tomé-Açu in 1951. His cedro branco trees had been burnt by subsequent immigrants to produce ash for rice cropping. Tokuhashi also tried to plant brazilnut, but had problems with germination and ant damage. Nevertheless two brazilnut trees he planted survive today. The Company gave Tokuhashi some cacao saplings, which would not grow without shade trees.

Takashi Okabe (1922-) said his elder brother was given four brazilnut seeds from the Japanese Plantation Company of Brazil (Okabe 1996). Following specifications, the seeds were soaked in kerosene for one night to break their dormancy, to minimize ant damage, and protect them from being eaten by hungry children. The trees from these seeds grow today in Okabe's homegarden, with two of them having survived lightning strikes to regrow from sucker sprouts. Okabe also remembered the Company ordered his family to plant kōzo trees in Boa Vista Lot No. 16 for paper making (note: Tomé-Açu lot maps are in Figures 5-1 through 5-4 of Chapter 5). The grown trees had up to 20 cm of stem diameter. Yōichirō Kimura (1931-) confessed (Kimura, Y.

1996) that he dug up brazilnut seeds with a sickle to assuage his hunger while weeding a nursery. Enji Saitō (1891-1958) planted brazilnut trees on 2 ha of his lot at Arraia (Lot No. 59), where 45 trees survive in 1996. They are 33-35 m tall, and have diameters at breast hight (DBH) reaching 130-190 cm.

Ultimately, however, the failure of cacao, World War II, and the serendipitous success of black pepper diverted the course of agricultural development in the Amazon. From the 1940s through the 1960s, agroforestry practices were confined to homegardens. The resurgent get-rich-quick attitude of immigrants led them only to produce more black pepper with increasingly intensive management. An exception to this was Tomoji Katō (1898-1956), the pioneer of black pepper and sisal hemp culture at Tomé-Açu, who in 1946 planted acapu and maçaranduba on 5 ha of early secondary bush (***capoerinha***) after rice cultivation (Katō, L.K. 1996). He wished to produce black pepper stakes from this wood. According to his son, Lauro Kunizō Katō (1926-), these trees were destroyed by fire (Katō, L.K. 1996). Thus, the most substantial transformation of agriculture would have to wait until the 1970s, when *Fusarium* wiped out black pepper plantations, suddenly making large areas available for new crops.

Fusarium Crisis of Black Pepper and Collective Introduction of Alternative Crops

From May to July of 1970, ***CAMTA*** called joint meetings of experts from the Agriculture and Cattle Ranching Research and Experimentation Institute of the North (***IPEAN***), the Daini Tomé-Açu Experiment Station (predecessor of ***INATAM***), and ***CAMTA***'s own experiment station. The assembled experts scrutinized many potential alternative crops, particularly spice crops with high unit prices that were most suited to the geographic isolation of Tomé-Açu. The group could identify no better course of action than to continue black pepper culture. [Sakaguchi 1994]

CAMTA's board directed Noboru Sakaguchi (1933-), then ***CAMTA***'s director in charge of crops, to take on one alternative test crop as his responsibility. He had read a ca.1930 report by Kōzō Yoshida on cacao cultivation in Trinidad. This report had been saved by Ietoshi Ebata (1897-1969) from seizure, when all Japanese language documents had been confiscated during the World War II. Though old, the report still included compelling insights about cacao's potential when following black pepper culture. Moreover, Tōru Ikeda (1922-) and Yōichirō Kimura (1931-) had reintroduced cacao from Cametá in 1958, and had achieved ideal growth between rows of live black pepper plants. Sakaguchi soon submitted the first 5-year cacao propagation

plan (1970-74) for 1,000,000 trees to ***CAMTA***. Cooperative members were skeptical of this plan, and authorized the planting of only 400,000 trees. Sakaguchi ended up planting 10,000 cacao seedlings on his 16 ha farm from 1970 to 1972. He intercropped the cacao with coffee, rubber, andiroba, sumauma, guaraná, palheiteira (*Clitoria racemosa*) and eritrina (*Erythrina poeppigiana*) from 1973 to 1975. Birds also helped by depositing acaí seeds in his cacao field. In May of 1974, the black pepper plantations at Tomé-Açu were decimated by water damage after heavy rains, which actually favored the growth of cacao. Between May and June of 1976, cacao bean prices jumped from US$ 400/t to US$ 4,800/t. According to Sakaguchi (1995), this jump was caused by a World Health Organization (WHO) ruling to prohibit the inclusion of fossil oils in cosmetics. Sakaguchi immediately repaid all his debts and bought a new tractor. His success stimulated other farmers to plant cacao. The 1,000,000 tree goal now set in the second 5-year cacao propagation plan (1975-79) was attained between 1975 and 1976. [Yanagihara 1994]

Farmers adopted Sakaguchi's mixed-planting practices to varying degrees. Mixed planting was commonly referred to as '*konshoku*' in Japanese, and as '***consórcio***' in Portuguese. Passionfruit was introduced in the early 1970s, and trained to grow on overhead wires spanning between stakes of black

pepper (see Chapter 3). This addition increased options for even more cropping combinations. For example, one black pepper crop over five years, and two subsequent passionfruit crops over six years would provide sufficient time for intercropped fruit trees to get well established, benefitting from their light shade and windbreak. These trees would also benefit from the simultaneous weeding, pruning and fertilizing afforded to the shorter-lived crops. Taketa (1982) reported that in 1980, 241 Japanese farms at Tomé-Açu comprised 34,406.3 ha, of which 5,276.65 ha were

Table 4-4. Intercropped species by production period at Tomé-Açu Settlement (1980)

Short-term (S)	freq.	Perennial (P)	freq.	Mid-term (M)	freq.	Long-term (L)	freq.
rice	2	passionfruit*[1]	10	orange	2	açai	1
feijão	3	black pepper	31	soursop	4	bacri	1
soybean	3	banana	1	avocado	3	brazilnut	4
pumpkin	3	papaya	11	cupuaçu	3	andiroba	2
melon	1			cacao	35	rubber tree	3
watermelon	1			coffee	10	freijó	15
cassava	1			guaraná	8	cedro	3
				other fruit trees	4	paricá	2
						ipê	1
						macacaúba	3
						mahogany	1
						terminalia	1
						other forest trees	3
total	14	total	53	total	69	total	40

Source: Stolberg-Wernigerode (1982). Frequency (freq.) refers to appearance of each crop in different crop combinations. The author cited in 1980, out of planted 5,276 ha, 1,738 ha (33%) were monoculture of cacao and 1,404 ha (27%) were monoculturet of black pepper. The major portion of mix-planted 1,564 ha (30%) should also be based on these two crops.

*[1] Passionfruit was a perennial crop until 1980s, however, since mid 1990s, some farmers allow only a year of fruiting with intensive management and replant the field. Papaya is botanically tree, but farmers treat it as a perennial crop.

Table 4-5. Crop associations by production period at Tomé-Açu Settlement (1980)

Type (Freq.)	Associated Crops and Sequence*[1]	
SP (8)	Rice or Feijão or Soybean → B. Pepper Rice + Soybean → B. Pepper B. Pepper → Melon or Watermelon*[2]	Pumpkin → Papaya Cassava → Banana
PP (2)	B. Pepper → Passionfruit or Papaya	
SM (1)	Pumpkin → Cacao*[3]	
PM (23)	B. Pepper or Passionfruit → Cacao*[3] B. Pepper + Passionfruit → Cacao*[3] B. Pepper → Avocado or Guaraná + Cacao	Banana or Papaya → Cacao*[3] B. Pepper + Papaya → Cacao*[3] Passionfruit → Coffee + Cacao*[3]
	B. Pepepr + Passionfruit → Other Fruit Trees + Cacao B. Pepper or Passionfruit or Papaya → Guaraná	
	B. Pepper + Papaya → Guaraná	B. Pepper or Papaya → Coffee
	B. Pepper → Guaraná or Other Fruit Trees + Coffee	
	B. Pepper or Papaya → Soursop B. Pepper → Other Fruit Trees	B. Pepper → Cupuaçu Papaya → Orange
SPM (4)	Feijão + B. Pepper or Passionfruit → Cacao*[3]	
	Soybean + B. Pepper + Papaya → Cacao*[3]	Pumpkin + Papaya → Soursop
MM (6)	Orange or Guaraná or Coffee or Cupuaçu or Other Fruit Trees + Cacao Soursop + Guaraná + Cacao	
PL (3)	B. Pepper → Andiroba or Bacuri or Freijó	
ML (13)	Avocado → Freijó Cacao or Cupuaçu + Freijó + Macacaúba	Coffee + Freijó Cacao + Coffee + Paricá
	Cacao + Brazilnut + Freijó + Cedro + Ipê + Other Forest Trees Cacao + Rubber Tree or Brazilnut or Freijó or Cedro or Other Forest Trees	
PML (7)	B. Pepper → Cacao + Andiroba or Cedro or Freijó B. Pepper → Coffee + Rubber Tree Passionfruit → Cacao + Freijó + Mahogany or Macacaúba Passionfruit → Cacao + Freijó + Paricá + Terminalia	
LL (2)	Açai + Freijó	Rubber Tree + Other Forest Trees

Source: Stolberg-Wernigerode (1982). See Table 4-4 for crop categories S, P, M, and L. There were 41 crop combinations of two species, 20 of three species, 6 of four species, 1 of five species and 1 of six species (by counting 'other trees' as one species).

*[1] While both marks '+' and '→' mean 'and,' the latter indicates crop succession course (crops on the left of '→' mark would eventually disappear).

*[2] Annual crops were planted in dying black pepper field.

*[3] While unlisted, these cacao trees were often intercropped with shade trees eritrina (*Erythrina poeppigiana*, etc.) and palheiteira. Otherwise, timber species would be planted later. Some people instead saved volunteer imbaúba trees that provide light shade for cacao trees.

planted. Of the planted area, 3,738.45 ha were in monocultures and 1,538.20 ha were in mixed-planting. Stolberg-Wernigerode (1982) identified 69 patterns of mixed-planting on 174 out of Tomé-Açu's 241 farms (Tables 4-4 and 4-5). Mixed planting included different combinations of annual, perennial, and tree crops.

When the majority of farmers had taken up cacao planting, Nobuyoshi Yokokura (1914-97) from Boa Vista District took notice of cupuaçu, cacao's 'big brother.' He requested and obtained cupuaçu seeds from the homegarden of Riuemon Yokoyama (1924-), one of his neighbors. Yokokura received education at a Farmer Training Center (see section Training of *Tokunō* Farmers, Cooperativism, and Diversified Farm Management), and became a model settler in Hokkaidō. He had survived the World War II campaigns in China and the South Pacific. Unsatisfied with farming at home in Ibaraki Prefecture after the war, he came to Tomé-Açu in 1955 and introduced poultry there. Yokokura expected the growth of cupuaçu to be as good as that of cacao, given the same conditions. In 1977, he gave seeds to Takurō Maki (1947-), a recently arrived immigrant from Ibaraki Prefecture who had settled in Cuxiu District of Daini Tomé-Açu. In 1978, Maki's neighbor Katsutoshi Watanabe (1945-) also asked for cupuaçu seeds from Yokokura. They both planted cupuaçu and cacao among timber tree species such as freijó, macacauba,

andiroba, cedro vermelho, mahogany, etc. However, the Executive Commission of Cacao Farming Plan (***CEPLAC*** [***Comissão Executiva do Plano da Lavoura Cacaueira***]), established in 1976 at Tomé-Açu, instructed farmers to remove cupuaçu and replace shade trees with palheiteira and eritrina, or else risk the loss of future financing. The reason for this disincentive was twofold: first, cupuaçu would become a host for witch's broom disease (*Crinipellis perniciosa*), facilitating subsequent infection of cacao (this was disproved later); and second, timber trees would not be as beneficial to cacao's growth as leguminous trees (this remains unproven). While many farmers obeyed, however unwillingly, some, including the three mentioned above, ignored ***CEPLAC***'s instructions. They would be the founders of commercial cupuaçu cultivation in the Amazon, as well as agroforestry systems employing various useful tree species. [Yokokura 1987, Personal observations and communications]

The Role of Homegardens and On-Farm Crop Trials

Homegardens (***quintais***) are maintained around the house of almost every farmer at Tomé-Açu. Their size ranges from one to three hectares. The homegarden (***quintal***) area is dedicated to supplying a farmer's family requirements, and include fruits, vegetables, medicinals, and ornamental plants. A homegarden may often include a nursery, and

sometimes a henhouse, a pigsty, a tortoise pen, or a small pond for pisciculture. Due to their spontaneous development and the presence of unique blends of tree species, some attaining heights of 35-40 m (e.g., brazilnut and paricá), each farm's homegarden has a distinctive appearance. The boundaries of some homegardens are difficult to distinguish, especially on farms with orchards around the main house that blend gradually into crop fields where agroforestry is practiced. Most species in homegardens have been introduced over the years by male family members, who travel more than females. However, some housewives made good collections of local medicinal plants, which came from neighboring yards of rural Brazilians. Additionally, friends, relatives, neighbors, laborers and visitors may bring new plant species as gifts, or in exchange for other species. The caretakers of homegardens have historically been housewives, elders, and minor children. Homegarden harvests are consumed by family members and laborers living on the farm. Garden surpluses may be given to neighbors, friends and relatives. They are also sold in unprocessed or home-processed form at local markets in Quatro Bocas and Tomé-Açu Town. Marketing of homegarden produce provides an income to garden caretakers, and allows them an opportunity to socialize while at the market.

Aiko Oshikiri (1920- , wife of Tanio Oshikiri) wrote memoirs about her father Enji Saitō (Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985), who brought her to Tomé-Açu from the snow country in Japan with promises of plentiful bananas hanging from tropical trees. Saitō was managing director of Tomé-Açu's still rudimentary cooperative during World War II (see Chapter 3). He grew many potential export crops in his homegarden to observe their behavior, including brazilnut, cacao, rubber tree, urucu, guaraná, and black pepper. Oshikiri affirmed, however, that if it had not been for her mother, who took loving care of her husband's plants with the children's help, Tomé-Açu would never have enjoyed the success of black pepper years later. Every crop present in Japanese settlements has apparently passed through such homegarden trials, trials that involved the collective contributions of all family members, regardless of gender. It has historically been the male head of household, however, who makes the final decision to plant a species as a main field crop. Such a decision weighs available market information and the opinions of family members with homegardening experience. Table 4-6 relates the profiles and development of some Japanese-Brazilian homegardens at Tomé-Açu.

These pioneers of new crops first propagated promising homegarden stock through seeding, cutting, and grafting.

Table 4-6. Four examples of homegardens at Tomé-Açu with focus on tree species

Common Name	Scientific Name	Yr. Planted	Origin (primary use)
Lot # Boa Vista 18 cultivated since early 1930's; Residencial area + Homegarden 2ha			
Owner: Takashi Okabe (1922-), arrival at Tomé-Açu in 1933, owned the lot since 1936			
<trees>			
abiu	*Pouteria caimito*	1985	L.K. Katō Farm at Boa Vista
ameixa do Pará	*Eugenia cumini*	1947	?
araça boi	*Eugenia stipitata*	1991	T. Yokoyama Farm at Boa Vista
araça pera	*Psidium actangulum*	1995	I. Kitabayashi Farm at Breu 4-6 - propagated by *CAMTA* for fruit juice
avocado	*Persea americana*	1980	purchased fruits from Southern Brazil in Belém
bacripari	*Rheedia macrophylla*	1990	grandson found at neighboring lot
bamboo	*Dendrocalamus giganteus*	1980's	I. Kitabayashi (relative) Farm at Breu 4-6
bilimbing	*Averrhoa bilimbi*	?	? (substitute of Japanese plum pickles *umeboshi*)
brazilnut	*Bertholletia excelsa*	1937	Japanese Plantation Company of Brazil
breadfruit	*Artocarpus incisa*	1993	L.K. Katō Farm at Boa Vista
breadfruit (seedless)	*Artocarpus incisa*	1993	T. Tokuhashi Farm at Agua Branca
cacao	*Theobroma cacao*	1970	first 'hybrid' seeds from *CEPLAC*, Bahia to *CAMTA*
candlenut (kukui)	*Aleurites moluccana*	1973	Miki Sawada brought from Hawaii
coconut	*Cocos nucifera*	?	?
coffee	*Coffea arabica*	?	Japanese Plantation Company of Brazil
cupuaçu	*Theobroma grandiflorum*	early 1930's	Japanese Plantation Company of Brazil
grapefruit	*Citrus paradisi*	1973	Miki Sawada brought from Hawaii
limãozinho	*Citrus* spp.	1970's	a nursery stock seller from viçosa, Minas Gerais
lime (limão tahiti)	*Citrus aurantifolia*	1970's	a nursery stock seller from viçosa, Minas Gerais
mahogany	*Swietenia macrophylla*	1995	T. Maki Farm at Cuxiu, Daini Tomé-Açu
mandarin orange (tangerina)	*Citrus deliciosa*	1960's	distributed by *CAMTA*
mountain soursop	*Annona montana*	early 1980's	T. Kohayakawa (*CAMTA*)
oil palm	Elaeis guineensis	early 1960's	Madagascar hybrid from Coop. Paraense at Santa Isabel do Pará
oiti	*Licania tomentosa*	?	seeds of street trees in Belém
peach palm (spineless)	*Bactris gasipaes*	1995	Adachi Farm at Breu 5-8 (near Daini Tomé-Açu Ramal 0)
poncan orange	*Citrus reticulata*	1991	a nursery stock seller from viçosa, Minas Gerais
quassia	*Quasia amara*	1994	S. Oppata Farm at Breu 4-6
rubber tree	*Hevea brasiliensis*	1937	Japanese Plantation Company of Brazil
scuuba	*Plumeria sucuuba*	?	volunteer (insect repellent)
shaddock	*Citrus grandis*	(mother tree 1933)	purchased fruits in Singapore when immigrated and brought seeds
<herbs; a part>			
amor crescido	*Portulaca pilosa*	?	? (for liver disorder)
angélica	*Fischeria* cf. *mariana*	?	? (for constipation)
chicória	*Eryngium ekmanii*	?	? (root for vermifuge, leaves for seasoning fish)
erva cidreira	*Lippia alba*	?	? (for insomnia)
hortelanzinho	*Mentha piperita*	?	? (to treat dark-colored stool of kids)
orelha de macaco	?	?	Concórdia do Pará (green juice for kids)

Table 4-6--continued

Common Name	Scientific Name	Yr. Planted	Origin (primary use)
vendicaá	*Alpinia japonica*	?	? (flower to relieve heart disorder, leaves for tea)
yomogi	*Artemisia princeps*	?	Sister in Japan (for tea, food additive, vermifuge and moxibustion)
Lot # Tomé-Açu (Açaizal) 185 cultivated since 1959; Residencial area + Homegarden 2ha			
Owner: Noboru Sakaguchi (1933-), arrival at Tomé-Açu in 1957, owned the lot since 1959			
<trees>			
abiu	*Pouteria caimito*	1976	M. Takeshita's yard in Belém
akagi	*Bischofia javanica*	1995	G. Sugiura (charcoal master) from Ogasawara Islands, Japan
allspice	*Pimenta officinalis*	1976	***Escola Média de Agropecuária Regional em Uruçuca***, Bahia
andiroba	*Carapa guianensis*	1960	M. Kinoshita at Quatro Bocas; mother tree of Jap. Plantation Company
albizia	*Albizia* spp.	?	volunteer
algaroba	*Prosopis juliflora*	1982	Ceará (fodder for goats and cattle)
araucaria	*Araucaria angustifolia*	1988	seeds purchased at ***CEASA***, Belém
avocado	*Persea americana*	1977	O. Hoshino grafted a varicty from São Paulo
bacri	*Platonia insignis*	?	volunteer
bilimbing	*Averrhoa bilimbi*	?	?
biribá	*Rollinia deliciosa*	1995	volunteer
boldo falso	*Veronia condensata*	1988	R. Uwamori Farm at Breu 5-8 (for liver disorder, diuresis, and diarrhea)
breadfruit (seedless)	*Artocarpus incisa*	1992	T. Tokuhashi Farm at Agua Branca
castanha	*Bertholletia* spp.	1985	Matsuda Farm at Registro, São Paulo
casuarina	*Casuarina equisetifolia*	1985	Y. Matsuda (JOCV) sent from the Philippines
camu camu	*Myrciaria dubia*	1987	Mr. Murakami (JICA), Belém
carambola	*Averrhoa carambola*	1974	purchased at market in Kuala Lumpur, Malaysia (*CAMTA* survey)
cedro	*Cedrela odorata*	1984	laborer from Rio Capim do Bujaru
cinnamon	*Cinnamomum zeylanicum*	1978, 90	Takasago Farm at Daini Tomé-Açu
coconut (praia)	*Cocos nucifera*	1962	S. Wada Farm at Tomé-Açu (father in law)
coconut (anão)	*Cocos nucifera*	1970	T. Ikeda Farm at Breu 1-2
cumaru	*Coumarouna odorata*	1965	S. Katō at Boa Vista brought from Belém
cupuí	*Theobroma subincanum*	1990	volunteer
cuia	*Crescentia cujete*	1970	Igarapé-Açu, Pará
durian	*Durio zibethinus*	1979	purchased at a stall in Johor Bharu, Malaysia (*CAMTA* survey)
eggfruit	*Pouteria campechiana*	1976	O. Hoshino Farm at Boa Vista
flamboyant trec	*Delonix regia*	1966	Mr. Yamanaka brought from Tōzan Farm, São Paulo to Belém
gmelina	*Gmelina arborea*	1970	seeds from Jari Project through Dept. of Agriculture
Guiana chestnut	*Pachira aquatica*	1974	Mr. Higashi (JICA), Belém, Pará
horseradish tree	*Moringa oleifera*	1976	T. Oshikiri Farm at Arraia
India rubber tree	*Ficus elastica*	1978	Mr.Araki (junior at Tokyo University of Agriculture) Farm, Atibaia, SP
inga (long capsule)	*Inga belemensis*	1984	a farm at Abaetetuba, Pará
jaboticaba	*Myrciaria cauliflora*	1973	***Escola Média de Agropecuária Regional em Uruçuca***, Bahia
jacarandá do Pará	*Dalbergia spruceana*	1974	someone (JICA) brought from Monte Alegre, Pará
langsat	*Lansium domesticum*	1979	purchased at market in Kuala Lumpur, Malaysia (*CAMTA* survey)

Table 4-6--continued

Common Name	Scientific Name	Yr. Planted	Origin (primary use)
leucaena	*Leucaena leucocephala*	1976	Juazeiro, Bahia
limão galego	*Citrus aurantifolia*	?	?
litchi	*Litchi chinensis*	1979	purchased at market in P'ing-tung, Taiwan (*CAMTA* survey)
longan	*Euphoria longan*	1979	purchased at market in P'ing-tung, Taiwan (*CAMTA* survey)
macadamia	*Macadamia ternifolia*	1978	purchased at plant nursery Dienberger at Limeira, São Paulo
madre de cacao	*Gliricidia sepium*	1985	Y. Matsuda (JOCV) sent from the Philippines
mandacarú (?)	*Cereus mandacaru* (?)	1976	border of Pernambuco and Piauí (local house construction material)
mandarin orange (mexerica)	*Citrus deliciosa*	?	?
mandarin orange (murcote / tangerina)	*C. deliciosa*	1980	purchased at plant nursery Dienberger at Limeira, São Paulo
mangosteen	*Garcinia mangostana*	1961	R. Hiraga from ***IPEAN***, Belém; mother tree of Tomé-Açu
marang	*Artocarpus odoratissima*	1987	Y. Matsuda (JOCV) sent from Mindanao, the Philippines
mundu (*or* rata)	*Garcinia Dulcis*	1960	From K. Yamamoto in São Paulo to R. Hiraga at Tomé-Açu
sumauma	*Ceiba pentandra*	?	volunteer
neem	*Azadirachta indica*	1984	Mr. Nishina (Takasago Co.) brought from Thailand and Burma
nutmeg	*Myristica fragans*	1976	***Escola Média de Agropecuária Regional em Uruçuca***, Bahia
orange jasmine	*Murraya paniculata*	1981	Dominican Republic (JICA survey)
palm	?	1990	Dominican Republic (JICA survey)
papaya (Taiwan)	*Carica papaya*	1979	*Nóngyǒu Zhòngmiáo* in Kao-hsiung, Taiwan (*CAMTA* survey)
paulownia (Taiwan)	*Paulownia* spp.	1993	Mr. Satō of Eidai do Brasil, Belém
peach palm	*Bactris gasipaes*	1970	***IPEAN***, Belém
poncan orange	*Citrus nobilis*	1977	Kikuchi Farm at Acará - Paes de Carvalho Settlement
poncan orange	*Citrus nobilis*	1980	purchased at plant nursery Dienberger at Limeira, São Paulo
puxuri	*Licaria puchury-major*	1982	S. Wada Farm at Tomé-Açu; mother tree from Açaizal Exp. Station
quassia	*Quassia amara*	1976	K. Iwama (now S. Oppata) Farm at Breu 4-6
rambutan	*Nephelium lappaceum*	1979	purchased at market in Johor Bharu, Malaysia (*CAMTA* survey)
rubber tree	*Hevea brasiliensis*	1959	Goodyear Nursery at Igarapé-Açu; purchased 3,000 for distribution.
sago palm	*Cycas revoluta*	?	K. Suzuki Farm at Mariquita
sassafras	*Ocotea cymburum*	1988	Takasago Farm at Daini Tomé-Açu
Seville orange	*Citrus aurantium*	1977	*INATAM*
soursop	*Anona muricata*	1991	H. Seki Farm at Ipitinga
star anise (round fruit)	*Illicium* spp.	1973	***Escola Média de Agropecuária Regional em Uruçuca***, Bahia
sugi (obisugi)	*Cryptomeria japonica*	1981	K. Shimomaebara at Breu 4-6 from Miyazaki Forest Exp. Sta., Japan
sugi (yakusugi)	*Cryptomeria japonica*	1980	Consul Mr. Takano in Belém brought from Miyazaki, Japan
sweet orange (pêra)	*Citrus sinensis*	1980	purchased at plant nursery Dienberger at Limeira, São Paulo
tamarindo	*Tamarindus indica*	1977	S. Ōdō (*INATAM*) from Pakistan
tea (5 cultivars)	*Camellia sinensis*	1981	Registro, São Paulo
ueuba	*Virola surinamensis*	1995	volunteer
umbu	*Spondias tuberosa*	1976	purchased seeds at Juazeiro, Bahia (*INATAM* excursion)
unshiu orange	*Citrus unshiu*	1986	K. Ikeda Farm at Breu 1-2; old variety introduced by early immigrants
uxi	*Endopleura uxi*	1982	S. Takahashi Farm at Ipiranga, Daini Tomé-Açu

Table 4-6--continued

Common Name	Scientific Name	Yr. Planted	Origin (primary use)
yuzu	*Citrus* junos	?	seeds from Japan
<herbs; a part>			
aipim	*Manihot aypi*	?	Rio de Janeiro
chili	*Capsicum* spp.	1988	K. Mineshita from Chili
zedoary	*Curcuma zedoaria*	1980	Mr. Yoshii (junior at Tokyo Univ. of Agr.) sent from Campinas, SP
jambu	*Spilanthes acmella*	1959	S. Wada Farm at Tomé-Açu (father in law)
'peixe boi'	?	1980	former Açaizal Experiment Station, Tomé-Açu (for diabetes)
cardamom	*Elettaria cardamomum*	1971	M. Tsurusaki (*CAMTA*)
conabi	*Thyllanthus conami*	?	? (for fish poisoning)
'erici parigori'	?	1992	pot of an old Brazilian woman at Tomé-Açu (for diarrhea)
ginger (Trinidad)	*Zinziber officinale*	1971	M. Tsurusaki (*CAMTA*)
'molho de mato'	?	1970	yard of a Brazilian resident at Tomé-Açu (condiment for tucupi)
patchuli	*Pogostemon patchouly*	1960's	Takasago Farm at Daini Tomé-Açu
vanilla	*Vanilla planifolia*	1960's	R. Hiraga from *EMBRAPA*, Belém
vanilla (Mexico)	*Vanilla planifolia*	1969	N. Yaeo (JICA) from Mexico
vanilla (Madagascar)	*Vanilla planifolia*	1970's	Takasago Co. from Madagascar
Lot # Breu 5-8 (Daini Tomé-Açu Ramal 0) 290 cultivated since 1964; Residencial area + Homegarden 2ha Owner: Rokusono Uwamori (1913-), arrival at Parintins in 1933 as *Kōtakusei*, arrival at Daini Tomé-Açu in 1962, owned the lot since 1964			
<trees>			
açai branca	*Euterpe oleracea*	1970	S.S. Tanisue Farm at Breu 3-7
allspice	*Pimenta officinalis*	1986	Bahia (*INATAM* excursion)
avocado	*Persea americana*	1970	a daughter studying in Manaus sent seeds of good fruits in market
bacaba (multistalk)	*Oenocarpus multicaulis*	1988	K. Yokoyama Farm at Castanhal, Pará
bacabinha palm	*Oenocarpus minor*	1984	T. Fujihashi Farm at Agua Branca
bamboo	*Dendrocalamus giganteus*	1985	Rio de Janeiro
banana	*Musa sapientum*	?	? (ev. roxo, prata, ouro, inajá, etc.)
breadfruit (seedless)	*Artocarpus incisa*	?	Santarém, Pará
sapodilla (large fruit)	*Achras sapota*	1975	O. Hoshino Farm at Boa Vista
cinnamon	*Cinnamomum zeylanicum*	1975	K. Iwama Farm (now S. Oppata Farm) at Breu 4-6
cupuaçu (seedless)	*Theobroma grandiflorum*	1982	Chiba Farm (grafted) - designated *CAMTA* stock plant
cutite	*Pouteria macrophylla*	1975	T. Shishido Farm in Belém
durian (montong)	*Durio zibethinus*	1986	S. Ōdō (*INATAM*) from Thailand - designated *CAMTA* stock plant
genipa fruit	*Genipa americana*	1978	?
Guiana chestnut	*Pachira aquatica*	?	T. Kohayakawa (*CAMTA*)
ipé amarelo	*Tabebuia serratifolia*	1974	*INATAM*
jaboticaba	*Myrciaria cauliflora*	1979	Y. Shibata Farm at Mariquita
laranja da terra	*Citrus* spp.	1994	a Brazilian resident in neighbor
'lima' (medicinal)	?	1994	a Brazilian resident in neighbor
mango (rosa / bacuri)	*Mangifera indica*	1965	São Luis, Maranhão
mapati	*Pourouma cecropiaefolia*	1986	*INATAM*

Table 4-6--continued

Common Name	Scientific Name	Yr. Planted	Origin (primary use)
marirana	*Couepia subcordata*	1970	São Luis, Maranhão
patauá palm	*Jessenia bataua*	1986	from a frend at Monte Alegre, Pará
peach palm (spineless)	*Bactris gasipaes*	1975	M. Kinoshita at Quatro Bocas
peach palm (big fruit)	*Bactris gasipaes*	1989	M. Hamada Farm at Santa Isabel to Pará (Women Association Visit)
peach palm (Peru)	*Bactris gasipaes*	1986	Bahia (*INATAM* excursion)
piquiá	*Caryocar villosum*	1994	seeds from S. Takahashi Farm (son in law), Ipiranga, Daini Tomé-Açu
quassia	*Quassia amara*	1994	S. Oppata Farm at Breu 4-6
shaddock	*Citrus grandis*	1988	K. Yokoyama Farm at Castanhal, Pará
star apple	*Chrisophyllum caimito*	1975	T. Shishido Farm in Belém
tapcrebá	*Spondias lutea*	1965	seasonal laborer of black pepper brought from Cametá on request
taperebá	*Spondias lutea*	1972	C. Saeki Farm (brother in law) at Breu 4-6
tucumã grande	*Astrocaryum tucuma*	1983	A friend's farm at Boa Esperança, Parintins, Amazonas
yuzu	*Citrus* junos	1994	N. Sakaguchi Farm at Tomé-Açu
<herbs; a part>			
maracujá-açu	*Passiflora quadrangularis*	1995	seeds from Bahiano, a cacao trimmer
Lot # Daini Tomé-Açu Cuxiu 2-241 cultivated since 1967; Residencial area + Homegarden 1.0ha			
Owner: Takurō Maki (1947-), arrival at Tomé-Açu in 1967, owned the lot since 1969			
<trees>			
abricó	*Mammea americana*	1980's	N. Yokokura Farm at Boa Vista
algaroba	*Prosopis juliflora*	1982	Ceará (fodder for goats and cattle)
ameixa do pará	*Eugenia cumini*	1992	Esperança Elementary School at Cuxiu, Daini Tomé-Açu
acerola	*Malpighia glabra*	early 1980's	G. Niwa Farm at Ipiranga, Daini Tomé-Açu; originally from *INATAM*
araça boi	*Eugenia stipitata*	1989	T. Sugaya Farm at Cuxiu, Daini Tomé-Açu; originally from Manaus
avocado	*Persea americana*	1974	Daini Tomé-Açu Agricultural Experiment Station
bacripari	*Rheedia macrophylla*	1988	*CAMTA*
bamboo	*Dendrocalamus giganteus*	1976	T. Hidaka Farm at Boa Vista
bilimbing	*Averrhoa bilimbi*	1977	M. Ōnuki Farm (father in law) at Ipiranga, Daini Tomé-Açu
boldo falso	*Veronia condensata*	1992	*CAMTA*
cacauí	*Theobroma speciosum*	1980's	volunteer
candlenut (kukui)	*Aleurites moluccana*	1975	San Stepano Farm of Elizabeth Saunders Home at Daini Tomé-Açu
carambola	*Averrhoa carambola*	late 1960's	Mr. Okada (former lot owner, now in Belém)
carambola (sweet)	*Averrhoa carambola*	1990	N. Sakaguchi Farm at Tomé-Açu
casca preciosa	*Aniba canelilla*	1980	Brazilian laborer brought saplings
castard apple	*Annona squamosa*	1990	fruits from Belém
cedro	*Cedrela odorata*	1976	seeds from forest at Daini Tomé-Açu
sapodilla	*Achras sapota*	?	*CAMTA*
freijó	*Cordia goeldiana*	1974	wild seedling from forest at Daini Tomé-Açu
guava	*Psidium guayava*	?	volunteer
Guiana chestnut	*Pachira aquatica*	late 1970's	N. Sakaguchi Farm at Tomé-Açu
Indian snakeroot	*Rauwolfia serpentina*	1980's	G. Niwa Farm at Daini Tomé-Açu; original plant from *INATAM*

Table 4-6--continued

Common Name	Scientific Name	Yr. Planted	Origin (primary use)
jaborandi	*Pilocarpus microphyllus*	1980's	G. Niwa Farm at Daini Tomé-Açu; original plant from *INATAM*
jaboticaba	*Myrciaria cauliflora*	1976	Y. Shibata Farm at Mariquita
jacarandá da Bahia	*Dalbergia nigra*	1976	*JAMIC* office in Bahia
jackfruit	*Artocarpus integrifolia*	late 1960's	Mr. Okada (former lot owner, now in Belém)
jambu	*Spilanthes acmella*	?	volunteer
kumquat	*Fortunella japonica*	1970	H. Kondō Farm at Arraia
limão galego	*Citrus aurantifolia*	late 1960's	Mr. Okada (former lot owner, now in Belém)
limãozinho	*Citrus* spp.	late 1960's	Mr. Okada (former lot owner, now in Belém)
lime (limão tahiti)	*Citrus aurantifolia*	1982	S. Ōtake Farm at Cuxiu, Daini Tomé-Açu
macacauba	*Platymiscium ulei*	1976	*Museu Paraense Emílio Goeldi* in Belém
macadamia	*Macadamia ternifolia*	1985	*CAMTA*
mahogany	*Swietenia macrophylla*	1976	seeds from Daini Tomé-Açu Agricultural Experiment Station
mandarin orange (murcote)	*Citrus deliciosa*	late 1970's	*INATAM*
mandarin orange (tangerina)	*Citrus deliciosa*	late 1980's	M. Ōnuki Farm (father in law) at Ipiranga, Daini Tomé-Açu
mango (haden)	*Mangifera indica*	1978	seeds from K. Nishio Farm at Boa Vista; originally from São Paulo
mango (haden)	*Mangifera indica*	1978	Mr. Tsutsumi brought seeds from Manaus
mangosteen	*Garcinia mangostana*	1990	M. Ōnuki Farm (father in law) at Ipiranga, Daini Tomé-Açu
marupá	*Simarouba amara*	1977	*IBDF* at Santa Isabel do Pará
mulberry	*Morus bombycis*	1978	Breu
neem	*Azadirachta indica*	1987	*COPAMASA* at Arraia (from manager N. Sakaguchi)
paricá	*Schizolobium amazonicum*	1980	seeds from T. Taketa Farm at Boa Vista
pau rosa	*Aniba rosaeodora*	1976	Mr. Kosuga of Daini Tomé-Açu Agr. Exp. Sta. from Manaus
piquiá	*Caryocar villosum*	1981	seeds from forest at Daini Tomé-Açu
pitanga	*Stenocalyx pitanga*	1980	Y. Kimura Farm at Agua Branca
persimmon	*Diospyros kaki*	1976	Y. Shibata Farm at Mariquita
sabiá	*Mimosa caesalpiniaefolia*	1990	Ceará (*CAMTA* survey)
shaddock	*Citrus grandis*	1975	sapling from H. Tsubaki Farm at Cuxiu, Daini Tomé-Açu
sweet orange (pêra)	*Citrus sinensis*	?	volunteer
soursop	*Anona muricata*	1977	Nobusawa Farm at Cuxiu, Daini Tomé-Açu
umbu	*Spondias tuberosa*	1976	purchased seeds at Juazeiro, Bahia (*INATAM* excursion)
ume (Taiwan)	ume (Taiwan)	1990	G. Niwa Farm at Ipitinga, Daini Tomé-Açu
uxi	*Endopleura uxi*	1981	seeds from forest at Daini Tomé-Açu
<herbs; a part>			
cabacinha	*Lufa operculata*	?	? (for sinusitis)
ipecac	*Cephaelis ipecacuanha*	1992	G. Niwa Farm at Ipiranga, Daini Tomé-Açu
panfila	*Kaempferia* spp.	?	*CAMTA*
pariri	*Egletodendron pariri* (?)	?	a laborer brought in (for liver disorder)
vinagreira	*Hibiscus sabdariffa*	?	M. Ōnuki Farm (father in law) at Ipiranga, Daini Tomé-Açu
zedoary	*Curcuma zedoaria*	1990	N. Sakaguchi Farm at Tomé-Açu

Some farmers performed individual selection, as in the selection of acerola by Yōichi Inada (1950-) and Toshihiko Takamatsu (1944-), who developed ***CAMTA***-recommended cultivars (see Chapter 3). Only cacao, rubber tree, and oil palm by-passed such a local selection stage, by being introduced as 'good variety' seed through the Japanese Plantation Company of Brazil and ***CAMTA***.

Even so, Hisaharu Kusano (1927-) and Tsuneo Kusano (1948-) toiled for more than ten years, beginning in the mid-1970s, to develop a cacao cultivar resistant to witch's broom disease. According to Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai = ***CAMTA*** (1986), the Kusano father and son team marked every 'Bahian Hybrid' cacao tree planted near their home with a strip of fertilizer bag, removing the strip when the disease appeared. Four years later, when the plantation was seven years old, only four individual cacao trees remained free of infection. After trial and error, The Kusanos succeeded in grafting sucker buds of these resistant trees to infected trees in 1981. About 800 of these grafts were found to be healthy in November of 1986, all located leeward of an infected block of cacao. In that year, they cross-pollinated numerous tiny cacao flowers of individuals with proven resistance. According to the Kusanos (1996), some flowers did bear cacao fruits but were destroyed by hired laborers who ignored their marking tags.

The Kusanos then employed resistant bud grafting on artificially bent suckers of infected trees, in order to quickly renovate the plantation. This method became popular among Tomé-Açu farmers. Kusanos provided their resistant tree buds and grafting techniques to anyone, by the arrangements of ***CAMTA*** and Tomé-Açu Friends of Agriculture Association (*Nōyūkai*). The senior Kusano, an ex-trainee of a Farmer Training Center in Japan and a survivor of a *Kamikaze* flotilla, cited his own grandfather's words, saying that 'a farm sees its completion when the farmer has worked so long and hard until the base of his house decomposes and becomes fertilizer in his field.' The Kusanos' initiative was applied to witch's-broom-resistant cupuaçu selection and propagation by ***ATEA***. Bud grafting of cupuaçu saw favorable initial results at Sasahara and Uwamori Farms. During 1995-96, this author observed cupuaçu grafting becoming more popular among Tomé-Açu farmers [Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1986 and 1987f, Personal observations]

Another post-war immigrant farmer, Masahiro Hamada (1950-) arrived at Santa Isabel do Pará in 1970. There he meticulously sketched symptoms of progressive black pepper diseases in his farm. After six years of farming, Hamada requested ***INATAM*** to hire him, by presenting his black pepper disease observation records. Hamada found a limit for an individual farmer to study and fight back against difficult

diseases. Hamada's name first appeared in the ***INATAM*** brochure of 1977, as an 'employee in charge of nematode survey' (Kokusai Kyōryoku Jigyōdan Belém Shibu 1977). Hamada finally discovered perithecium of *Fusarium solani* in 1984, verifying air-born infection of the disease (Kokusai Kyōryoku Jigyōdan 1985, Hamada 1985, Ishibashi 1986). After the closure of ***INATAM*** in 1986, Hamada worked for ***ASFATA*** till 1988, and disseminated the results of his study among Tomé-Açu farmers. He contributed articles to the ***CAMTA*** Journal (***Jornal CAMTA*** = *Tomé-Açu Kumiai Dayori*), concerning cacao cultivation (Nos. 21 and 23), black pepper cultivation (Nos. 26, 27, and 28), simplified cleft grafting method for cacao, orange and avocado (No. 30), economic evaluation of new black pepper varieties (No. 32), cacao hybridization (Nos. 35 and 37), and application of tissue culture on farming (Nos. 39, 40, 41, and 42) (Hamada 1986a-e, 1987a-f, 1988a, and 1988b).

Tomé-Açu had outstanding farmers (*tokunō*) other than listed above, who were asked to collaborate in field experiments with ***CAMTA***, ***INATAM***, and Brazilian institutions in Pará and other states. After 1981, when ***JAMIC*** was dissolved, JICA began introducing such farmers to ***EMBRAPA-CPATU***, Federal Agricultural College of Pará (***FCAP***), and universities in southern Brazil. Field experiments have often been conducted in homegardens and adjacent fields,

where farmers can easily monitor cropping trials and researchers can have easy access.

The Contributions of ***CAMTA***

Kagawa and Fujisaki recommended tree crops that produce valuable fruits and timber simultaneously as the major element of 3-D agriculture (*Rittai Nōgyō*). They state that 3-D agriculture "is more complicated than two-dimensional diversified farming (*Takakkei Nōgyō*), requiring greater inputs of capital and labor, more knowledge and skill, and a firm commitment on the part of the farmer." The authors affirm that mutual cooperation through production unions (*sangyō kumiai*) is the solution. They add: "3-D agriculture is a viable form of agriculture, if not particularly profitable, for it can establish stable national agricultural policies and permanent farm economics." [Kagawa and Fujisaki 1935]

CAMTA performed important roles in fostering agroforestry practices at the Tomé-Açu settlement. Takashi Okabe (1922-), who held consecutive posts as public relations director (***diretor secretário;*** 1969-73) and then as managing director (***diretor gerente;*** 1973-78) reminisced about new crop introductions during the time of his ***CAMTA'***s posts (Okabe 1995). Soon after his appointment, he was called by Mr. Amorim of the Pará State Bank, who suggested

that farmers undertake passionfruit cultivation. Mr. Amorim recommended the utilization of woodstakes left in perished black pepper fields as trellis supports for passionfruit. Passionfruit had previously been only a homegarden crop. But Pará State now offered to finance passionfruit culture through the bank, provide tax exemptions, and arrange a buyer: the Gelar Ice Cream Company. After establishment of the simplified cropping system by a ***CAMTA*** member in 1972 (see Chapter 3), passionfruit became the most important catalyst for tree cropping in the area.

As for cacao, ***CEPLAC*** hadn't yet let 'hybrid' seeds out of Bahia. Okabe entreated Dr. D. Carneiro, then an executive board member of the ***Banco do Brasil***, to help the cooperative obtain cacao seeds (Okabe 1995). President Hajime Yamada (1927- ; term 1969-73 and 1979-83) of ***CAMTA*** was soon permitted to go to Itabuna, Bahia to obtain seeds vital to the execution of ***CAMTA***'s first 5-year cacao plan (1970-74). In 1976, ***CEPLAC*** began extension services at Tomé-Açu, opening a branch office near Quatro Bocas. The establishment of cacao cultivation was beneficial to the settlement, even though farmers did not always follow the recommendations of newly arrived extension workers. ***CAMTA*** already had its own research and extension network, as well as innovative farmers (*tokunō*) among its members. The Kusano family aided in the identification of disease

resistant cacao trees, and then propagated them. Scion bud grafting techniques were then diffused by ***ATEA*** of ***CAMTA***, in collaboration with the Friends of Agriculture Association (*Nōyūkai*).

Messrs. Yokokura, Maki and Watanabe initiated cupuaçu cultivation, against the orders of ***CEPLAC***. ***CAMTA*** offered the use of its freezing facilities at Quatro Bocas and Belém for scissors-cut cupuaçu pulp (***cupu massa***) starting in 1980. This form of pulp processing (hand-extracted with scissors and frozen) set the standard for the current custom of local cupuaçu pulp marketing. Demand for fruit pulp to make cupuaçu candy and ice cream for the Nazare Festival in Belém during the first part of October, rewarded Mr. Watanabe with a windfall '10 times greater than the price of black pepper' (Watanabe 1996). Although the Pará government has recently discouraged home-made and hand-extracted cupuaçu pulp for public health reasons, there is still local market demand for it, due to its superior flavor. The fruit's flavor is felt to diminish when machine-processed (product called ***cupu polpa***).

In the 1980s, ***CAMTA*** initiated participatory research called 'excavation' (*Horidashi Chōsa*) to identify disease resistant trees of cacao, cupuaçu, and avocado. Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai (1987e) reports that interested farmers led by ***ATEA*** extensionists paid visits to *tokunō*

farms. These farmers designated so-called '*CAMTA* stock plants,' from which cacao and cupuaçu scions and seeds from resistant avocado rootstocks were collected. These were then propagated using the Kusano and Hamada grafting methods.

In the early 1990s, *CAMTA* received trial export orders for cupuaçu pulp from Cultural Survival, a US-based non-government organization (NGO). Cultural Survival wished to recognize the cooperative's commitment to sustainable agriculture and product quality with tangible support. Mr. Maki's product was shipped to the US at favorable prices, encouraging Tomé-Açu farmers to plant more cupuaçu trees. This marketing initiative also gave a positive signal to other interested parties in the Amazon. Through *CAMTA*, Maki received five visits from Acre farmers with the support of a US NGO (Maki 1996a). They came to learn agroforestry techniques of planting cupuaçu with freijó, macacauba, and other tree species. According to Homma (1996), the extent of yielding cupuaçu fields in Pará reached 1,289 ha by 1995, of which 439 ha were in the Tomé-Açu Micro-Region (the Municipality of Tomé-Açu accounted for 330 ha). Immature, non-producing cupuaçu fields had expanded to cover 4,608 ha, along with a further 2,574 ha that were planted that year.

Facing stiff competition from other area producers, and still having to cope with transportation handicaps, *CAMTA*

always needed to be one step ahead. As stated in Chapter 3, the cooperative has received research and extension support from ***INATAM,*** and subsequently from the JICA sponsored projects of ***EMBRAPA-CPATU.*** The modern juice factory at Tomé-Açu was realized through JICA subsidies. This opened up more fruit-culture options, though farm isolation still limited development of easily bruised fruits, such as acerola. Furthermore, the ***JEMIS*** fund through the ***Banco America do Sul*** was used to provide emergency financing to ***CAMTA*** during 1984-85. This asssistance was given in recognition of ***CAMTA'***s historic contributions to agricultural development of the Amazon. The cooperative barely survived this recent local economic turmoil. It continues to set standard producer prices at Tomé-Açu, benefitting all farmers in the region, including those not belonging to the cooperative. [Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1993, Personal communications and observations]

ATEA and chief Toshitsugu Kohayakawa

While ***CAMTA'***s presence has been instrumental to agroforestry development at Tomé-Açu, its extension services through ***ATEA*** (*Nōjibu*) under its chief, Toshitsugu Kohayakawa (1914-95; term 1982-94), deserve recognition. Kohayakawa had experience in subtropical agriculture from Taiwan. He had also worked for the Bayer Company in São Paulo before coming to Tomé-Açu. Nicknamed Dr. Zico (***Zico*** *Sensei*),

Kohayakawa visited cooperative members' farms and the cooperative nursery every day. He was accompanied by three staff, a Brazilian agronomist (***agronomo***), a technician (***técnico***), and a Japanese trainee from Tokyo University of Agriculture. The old Kohayakawa always wore worn-out workwear and rubber boots, and drove a white Volkswagen beetle with a ***CAMTA*** logo on its creaking doors. Maki recalled that Kohayakawa was a well-informed, experienced, and practically oriented engineer (Maki 1996a). For example, Kohayakawa duplicated an ***EMBRAPA*** Bayfidan application experiment on cacao trees in Acre, verifying its effectiveness. He injected Bayfidan to cupuaçu trunks during its vegetative growth season, and eradicated the witch's broom rot which had previously destroyed 60-80 percent of Maki and Watanabe's cupuaçu fruits at height of the rainy season. In 1995 Maki injected only one litre of Bayfidan (approximately US$ 70) divided into five doses, to 4,000 cupuaçu trees planted over 13 ha. According to Maki, standard spray dosages per hectare of wheat, a staple grain, had been indicated to be 4 litres with an interval of 30 days. Maki had been advised to apply such aerial spray on cupuaçu trees from a Japanese fruiticulture expert. Maki said (1996b), if not for the demonstration of Kohayakawa, he had followed the conventional spray method, which would have

been more costly to the farm budget, health of producer and consumer, and nature.

Each month Kohayakawa wrote a column called 'Extension Division News (***ATEA*** = *Nōjibu Dayori*)' in the ***CAMTA*** Journal (***Jornal CAMTA*** = *Tomé-Açu Kumiai Dayori*). There he included timely and detailed management suggestions for farmers. In the August 1986 issue (No. 24), he contributed a special article entitled 'Receiving US Researchers - Let Us Develop Agriculture We Could Be Proud Of' (Kohayakawa 1986). The following summarizes this article.

> "Dr. Christopher Uhl of the Pennsylvania State University accompanied (his Ph.D. student) Mr. Scott Subler to ***CAMTA*** on July 21, 1986. Dr. Uhl had visited Tomé-Açu three years previously, and was impressed by how Japanese immigrants had developed their agriculture in a tropical environment. At this time, Mr. Subler would like to stay at Tomé-Açu for an extended period, to conduct an ecological survey of Japanese farm management techniques. They expect that the results of this study would have useful implications for agricultural development throughout the Amazon Basin.
>
> I escorted them to interviews with Tomé-Açu farmers. Besides technical questions, they asked about the family histories of immigrants, and the reason why they had decided to remain in such a difficult environment. Furthermore, they asked what had helped the farmers to overcome difficulties: assistance from the Japanese government, mutual help through the agricultural cooperative, or religious faith? They observed what the Japanese call 'farmer spirit' (*Nōkon*), i.e., the love of soil and plants, and endurance. The researchers compared these farmers to American agricultural pioneers with expansive frontier spirits. The latter had created large plantation companies in the tropics, while the former had settled in the Amazon as individual small farmers. Unlike corporate operations, homestead management is more influenced by

psychological factors. I was impressed by the information collected and insight of these researchers.

They understood that at Tomé-Açu farmers had taken the principal initiative to undertake crop introductions and domestication in an exotic environment, though there had been additional inputs from technical experts. Moreover, on their current visit they found Tomé-Açu farmers trying to create a more ecologically sustainable agriculture through tree intercropping and green manuring. Compliments from visitors notwithstanding, it is true that Tomé-Açu farmers have survived many difficulties up to the present. Our experiences here could provide some useful lessons for future development of the Amazon. Hence, we should keep trying our best in agriculture, to impress our visitors.

They even knew about the projected fall in the black pepper market, coming in the next one to two years, and wanted to see how the Japanese might modify their farm management in response to this next crisis. At this point, I wondered if they had not been sent by the God to encourage us. We have barely been able to get this most recent crisis of a few years ago behind us (see Chapter 3). Now, just as we have somehow recovered, we must again reexamine our farm management, and prepare for an uncertain future. I am really looking forward to the return of Mr. Subler, whose research project challenges us both physically and mentally."

Dr. Scott Subler (1959-) stayed at Tomé-Açu from 1987 to 1988. He chose the Itō Farm at Breu 4-6 District as his ecological survey site of Japanese agroforestry. Subler once told this author that Kohayakawa probably better understood the nature of his research, and helped him more than any other person at Tomé-Açu. It seemed that Subler's presence, likewise, provided Kohayakawa encouragement to promote agroforestry through the ***ATEA*** extension services of ***CAMTA***.

In the June 1987 issue (No. 34) of the ***CAMTA*** Journal, Kohayakawa casually began writing about soil management and the overarching goals of agriculture (Kohayakawa 1987a). He first enumerated the three components of soil - physical, chemical and biological. He then synthesized these into terms compatible with farmers' notions of 'live soil (*ikitsuchi*)' and 'dead soil (*shinitsuchi*).' He proceeded to discuss current soil problems at Tomé-Açu (No. 36), and listed practical soil improvement methods through cultivation, drainage and the addition of organic matter (Kohayakawa 1987c). Leguminous green manure plants like mucuna (*Mucuna aterrima*), pueraria (*Pueraria phaseoloides*), guandu (*Cajanus cajan*), crotalária (*Crotalaria juncea*) and feijão-de-porco (*Canavalia ensiformis*) were recommended (No. 37), as cover crops for both agroforestry plots and fallow fields (Kohayakawa 1987e). He also presented a framework for agricultural management analysis (No. 35): a table indicating how natural and social factors affect farm management, from capital investment, to production, processing, marketing, and profit-taking (Kohayakawa 1987b). Kohayakawa emphasized the importance of agricultural cooperatives for farmers struggling with multiple limiting factors, and as a means to multiply any local advantages farmers might enjoy.

His discussion columns led to a 13-segment series called 'Considering Tropical Agriculture' (*Nettai Nōgyō wo Kangaeru*), published from November of 1987 (No. 38) through February of 1990 (No. 56). It was based on Kohayakawa's translation of ecological studies from Southeast Asia, Central-South America and Japan to help local farmers better interpret their experiences at Tomé-Açu, as well as to encourage their practice of agroforestry. The first three articles (Nos. 38, 40, and 41) described tropical forest succcession and the resilience of ecosystems after sustaining different types of disturbance. From these models, he derived implications for tropical agriculture, particularly the importance of organic matter supply and 'tree agriculture (*rinboku-nōgyō*)' to the maintenance of soil fertility (Kohayakawa 1987f, 1987g, and 1988a). In the fourth article (No. 42) he stated that the goal of mixed-cropping is to mimic natural forest ecosystems, in which emergent trees, short trees, and plants on the forest floor co-exist through niche-separation (Kohayakawa 1988b). He listed typical current forms of mixed-planting that 'preserve organic matter and soil fertility' at Tomé-Açu. The crop combinations were categorized according to different crop life cycles: i.e. short-term crops, mid-term crops, and long-term crops;

1) short + short (rice + corn, rice + cassava, corn + cassava, corn + feijão),

2) short + middle (passionfruit + black pepper),

3) short + long (passionfruit + rubber tree, passionfruit + cacao, passionfruit + cupuaçu, passionfruit + oil palm),

4) middle + middle (example not provided)

5) middle + long (black pepper + rubber tree, black pepper + cacao, black pepper + cupuaçu, papaya + oil palm),

6) long + long (rubber tree + cacao, rubber tree + cupuacu, cacao + freijó),

7) vegetables + middle or long (vegetables + black pepper, ginger + cacao, pumpkin + rubber tree).

Kohayakawa listed six selection criteria for crops that facilitate mixed-planting by farmers. These are:

1) plants that provide mutual (symbiotic) or one-sided (commensal) benefits;

2) plants that do not compete for soil water and nutrients (leguminous green manure plants can provide benefits to associated crops);

3) plants that do not share the same diseases and pests;

4) plants that follow different vegetative growth and reproductive cycles;

5) plants that increase a farmer's annual income;

6) plants that supply organic matter to the soil through crop debris and litter.

Kohayakawa stressed that in 'permanent (long-term) crop' (*einen sakumotsu*) combinations, understory trees and herbaceous species need to receive insolation appropriate to

their understory physiology, so that temperatures of leaves, the stand, and the forest floor promote efficient photosynthesis. To achieve this goal, planting orientation and distance must be designed well to secure moderate humidity within the stand. In orderly planted lots, working efficiency can also improve. Unfortunately, Kohayakawa found few formal studies of local agroforestry systems to marshall in support of his management recommendations. So, he encouraged farmers to carefully observe their own plantations, and make improvements accordingly. For example, rubber and black pepper were found to contribute little to the soil litter supply. Overgrown rubber trees reduced understory cacao and black pepper production, but black pepper endured well in shade. Kohayakawa became interested in conducting a biomass study in an agroforestry system involving these three species. However, he wrote that such research would be too costly for a small cooperative to do. He hoped that researchers at public institutions would become involved.

In his fifth article (No. 44), Kohayakawa described the characteristics and appropriate management of local soil types, organic matter decomposition in the tropics, and the nutrient requirements of black pepper (Kohayakawa 1988c). The importance of recognizing the difference between poor

local soils and fertile soils of southern Brazil was cited. Kohayakawa noted the risk of large-scale natural destruction, if farmers failed to pay attention to tropical soil management, and if they were to resort to large-scale shifting cultivation of black pepper. In the sixth and seventh articles (Nos. 47 and 48), he discussed mycorrhizae and soil micro-organisms in relation to agroforestry and natural forest ecosystems (Kohayakawa 1989a and 1989b). In the eighth article (No. 50), biological disease control through the use of companion plants and antagonistic fungi were mentioned (Kohayakawa 1989c). The ninth article (No. 51) dealt with insolation and atmospheric humidity (Kohayakawa 1989d), and the tenth article (No. 52) focused on wind (Kohayakawa 1989e).

Kohayakawa summarized his knowledge of tropical agriculture in the eleventh through thirteenth articles (No. 54, 55, and 56) (Kohayakawa 1989f, 1990a and 1990b). He recalled that formerly when farmers opened forest plots with manual labor, black pepper and passionfruit produced better and lasted longer than in more recent times, when machinery became available to create large-scale operations. He reviewed the physical, chemical and biological degradation of soil under current cultivation practices, and recommended measures for soil restoration. He emphasized agroforestry development through the initiative of farmers, organic

matter supply through the application of green manure, and composting. Various kinds of organic compost and fermentation agents available at Tomé-Açu were evaluated. Their advantages and disadvantages were discussed in terms of C/N ratios and constituents that inhibit decomposition.

In 1994, Kohayakawa retired and went to São Paulo after suffering internal injuries from a car accident. From his bed he wrote a comprehensive review of agroforestry development at Tomé-Acu. His draft was circulated among ***CAMTA***'s management, and then shelved for two years, until I was asked to edit it. While the draft is essentially similar to what he wrote in the ***CAMTA*** Journal, Kohayakawa's manuscript will merit further comment after it has been published.

Finally, Kohayakawa paid keen attention to the role of housewives in realizing successful agroforestry. He had managed ***CAMTA***'s Food Processing Committee (***Comissão de Industrialização de Produtos Agrícolas*** = *Kakō Iinkai*) as a participatory 'research institution, to adapt existing products to potential markets, and to develop new cooperative merchandise and farm crops' (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1993). The Committee was organized in April 1987, and worked closely with the ***CAMTA*** Women's Division founded in January 1987 (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai

1987a, 1987c, and 1987d). Two members of the Food Processing Committee assisted Kohayakawa: Eda Yuri Saiki Uwamori (1928-), who specialized in Brazilian-style food processing, and Reiko Yokoyama (1928-), who was skillful in preparing Japanese foods. Kohayakawa held meetings with housewives twice a month over seven years, beginning in 1987, until he was injured in February of 1994 (Uwamori, E. 1995). Participants at these meetings brought food samples they had made at home, and exchanged culinary ideas. They developed the following: ***'cupumix'*** (a lactic acid beverage with cupuaçu flavor), ***'geléia de cupuaçu'*** (cupuaçu jam), ***'salame de cupuaçu com castanha'*** (sweet cupuaçu sausage with brazilnuts), ***'cupulate'*** (cupuaçu chocolate), etc. (Kohayakawa 1987d, Uwamori, E. 1995). Japanese culinary innovations included: *'acerola cha'* (acerola leaf tea), *'acerola furikake'* (condiment including granulated acerola leaf for dredging on cooked white rice), *'acerola udon'* (acerola leaf enriched noodle), *'tsukemono'* (fermented pickles) made from green papaya and acerola fruits, etc. (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1993). Kohayakawa's speciality was liqueurs made from tropical fruits and herbs (Uwamori, E. 1995). He also taught the use of black pepper in cooking. These new products were introduced at ***CAMTA***-sponsored exhibitions, and sold at the cooperative's

supermarket at Quatro Bocas (Personal observations). The Rancher's Association of Acará Basin (***AAVA*** [***Associação Agropecuarista Vale do Acará***]), located at Boa Vista District, also requested the Food Processing Committee's participation at its own annual exhibitions, beginning in 1987 (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai. 1987g). Samples of processed food items were also shipped to ***CAMTA*** branch offices in São Paulo and Belém for market trials (Uwamori, E. 1988 and 1995).

Once a year, Kohayakawa accompanied housewives and several ***CAMTA*** board members to ***EMBRAPA-CPATU*** and ***FCAP*** in Belém (Kohayakawa 1987d, Uwamori, E. 1995). There they exchanged ideas with food processing specialists, and conducted their own market research. The tour participants received lectures and hands-on workshops at ***CPATU***, and in return demonstrated their own recipes. During the last two years, the tour group studied herbs to develop an '*Amazon cha*' (Amazon tea) for their own personal health and commercial sale (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1993, Uwamori, E. 1995). Kohayakawa led housewives on homegarden tours at Tomé-Açu, and printed pamphlets to introduce them to local medicinal plants (Uwamori, E. 1995). The first of these pamphlets, 'Popular Herbal Medicines of Tomé-Açu' (*Tomé-Açu no Minkanyaku*), listed 54 plant species and their

uses (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai Kakō Iinkai 1992). Participants often tried home-made herbal teas at their regular meetings. Ms. Uwamori recalled that they became aware of useful plant by-products that would otherwise have been wasted at the cooperative juice factory: like passionfruit seeds that could be processed into a sedative, and cupuaçu seeds which had various dietary and medicinal uses (Uwamori, E. 1995).

Kohayakawa also shared general information about agriculture with housewives, such as the kind of seedlings ***CAMTA*** was preparing in its nursery, and the potential of different crops in the future (Uwamori, E. 1995). This was an important learning opportunity for housewives, as they were usually isolated from agricultural information and insights by not attending cooperative meetings. Family heads, or husbands, were the ones who attended cooperative functions. Kohayakawa wrote the following in the ***CAMTA*** Journal No. 37 (Kohayakawa 1987d):

> "Our goal is to improve family dietary conditions first, and then to study the utilization of surplus food products. If we find a product that has commercial potential, we make intermediate-scale industrialization tests to increase income, and to return these profits to the producers. We must overcome various problems, one by one, through this process. In the future, an independent firm should be established to do food processing, following the examples of ***Coop. Cotia*** and ***Coop. Sul Brasil.***"

Japanese Government Research and Extension Services

Federation of Overseas Associations and Entarō Kamimura

After World War II, the first Japanese government-sponsored research and extension facility provided for immigrants in the Amazon was the Federation of Overseas Associations' Monte Alegre Experiment Farm (*Kaikyōren Monte Alegre Shiken Nōjō*), opened in 1957. This experimental farm became the responsibility of ***JAMIC*** after the Japan Emigration Service (*Kaigai Ijū Jigyōdan*) was incorporated in 1963, subsuming both the Federation of Overseas Associations (*Kaikyōren*) and the Overseas Emigration Company (*Ijū Shinkō*) (see Chapter 2). In these early years, the Federation of Overseas Associations and subsequent Japan Emigration Service hired a limited number of specialists in tropical agriculture to circulate around Japanese settlements. Because of the Japanese government's limited budget, these specialists could travel to remote locations only once a year. Only a mimeographed tabloid publication, issued by the Federation of Overseas Associations Amazon Branch in Belém, periodically contained agricultural information intended for isolated farmers.

A specialist of the Federation of Overseas Associations, Entarō Kamimura (1909-92, term 1960-64) set out to improve the extension situation. In January of 1961,

he organized the first Agriculture Course (*Nōji Kōshūkai*) at Chiba Farm in Tapanã, in the vicinity of Belém. The farm's owner was a *Kōtakusei* (see Chapter 3) who was having success with black pepper culture. This farmer donated board and accomodation to 5 lecturers and 16 course participants. Besides Kamimura and other specialists from the Federation of Overseas Associations and the Overseas Emigration Company in Belém, Renkichi Hiraga (1902-85) of Tomé-Açu, and Shin'ichi Satō (1902-91) of Castanhal gave lectures. For three days, lectures covered: an introduction to tropical agriculture, spice crops, citrus, black pepper, and poultry raising. After the lectures, participants made a field trip to Tomé-Açu. The entire course lasted one week.

The Federation of Overseas Associations subsidized course fees for one participant from each immigrant settlement. Participants were then obligated to share what they had learned with fellow settlers at follow-up courses in each settlement. These courses were found to be efficient, low-cost forms of extension. This same approach was then applied in other regions of Brazil. When the second agriculture course occurred in 1962, the Northern Agronomic Institute (***IAN***) offered support in the form of participant accomodations and training facilities. Mr. Renkichi Hiraga served as an interpreter for Portuguese-

speaking Brazilian researchers. ***IAN*** had previously emphasized studies on rubber culture, but this second course provided the impetus to include black pepper research, and create exchange programs with Japanese institutions.

Secondly, Mr. Kamimura launched the Contract Cropping (*Itaku Saibai*) system of crop introduction. This system was based on risk sharing with farmers trying new crops. The Federation of Overseas Associations subsidized seed and seedling production, transport, and new crop cultivation costs during the trial period. This risk sharing package was used to introduce poncan orange (*Citrus reticulata*), shaddock (*Citrus grandis*), lime, mangosteen, litchi (*Litchi chinensis*), soybean, paddy rice, etc. Except for litchi, most of these crop introductions yielded favorable results. When risk was shared, farmers became motivated to participate in crop research, diversification, and market development.

In the case of paddy rice, Kamimura returned from the Dominican Republic in 1961 with a handful of Taichū Rokujūgo-gō (Táizhōng No. 65) seeds. He had been dispatched to observe the difficult conditions that Japanese immigrants faced there. Some of them planted rice they brought from Japan by seeds. Taichū Rokujūgo-gō had been developed for sub-tropical paddy fields by Kamimura's former teacher Dr.

Eikichi Iso at the Imperial University of Taipei. Kamimura entrusted these seeds to Tatsuo Itō (1907-87), a resident of Guamá Settlement. Guamá was originally targeted for paddy rice production, but efforts to grow rice had been unsuccessful (see Chapter 3). There was insufficient infrastructure for irrigation and drainage, and an appropriate rice variety for local conditions was not yet identified. Even a farmer having the title of Rice Production Champion of Japan had failed to grow rice there. Kamimura taught Itō technical differences of Taichū Rokujūgo-gō croppoing, compared to cropping of temperate Japanese rice varieties. Out of 10 some stocks Itō succeeded to grow, only three bore seeds having survived the flood of Guamá River. The subsequent seed propagation was subsidized by the Contract Cropping system. Guamá's Taichū Rokujūgo-gō rice production attained marketable levels after three years. Fortunately the taste of this rice was liked by Brazilian consumers. This cultivar was then introduced in São Luis, Maranhão in 1963. Former wilderness grassland of the city outskirt was converted to rice paddy by the Japanese immigrants at Muruaí Settlement. They were also benefitted by the Contract Cropping system.

Last, but not least, Kamimura emphasized the key role of cooperatives in agricultural development, and created a

budget called Coopertive Promotion Expenses (*Nōkyō Joseihi*). The intent of these funds was to subsidize agricultural extension, road maintenance and the running of schools, all of which should have been the responsibility of local government. In reality, isolated cooperatives could not bear these extra costs without financial backing. ***CAMTA*** at Tomé-Açu had overextended itself trying to take on all three of these responsibilities, and its core agricultural activities suffered as a consequence.

The three immigrant assistance programs created by Kamimura - the Agriculture Course, the Contract Cropping system, and the Coopertive Promotion Expenses were sustained even after the Japan Emigration Service (*Kaigai Ijū Jigyōdan*) was subsumed by the Japan International Cooperation Agency (JICA = *Kokusai Kyōryoku Jigyōdan*) in 1974. These cost-efficient programs provided essential support for new crop introduction and agroforestry development of Japanese immigrants. [Kamimura, M. 1984]

INATAM and the Friends of Agriculture Association (*Nōyūkai*)

The experimental farm was relocated from Monte Alegre to Daini Tomé-Açu in 1966. It was expanded to become the Amazon Tropical Agriculture Experiment Institute (***INATAM*** [***Instituto Experimental Agrícola Tropical da Amazônia***] = *Amazônia Nettai Nōgyō Sōgō Shikenjō*) in 1974, and its full

facility was installed in November of 1977 (see Chapter 3). On March 14, 1980, the Agriculture Study Club (*Nōji Kenkyū Club*) was organized at ***INATAM*** by 11 farmers from Daini Tomé-Açu. This group was renamed the Daini Tomé-Açu Friends of Agriculture Association (*Daini Tomé-Açu Nōyūkai*) on August 10, 1980. A sister association, the Acará Friends of Agriculture Association (*Acará Nōyūkai*), was founded a little later at the Acará-Paes de Carvalho Settlement. The Daini Tomé-Açu Friends of Agriculture Association was again renamed, becoming the Tomé-Açu Friends of Agriculture Association (*Tomé-Açu Nōyūkai*) in 1983, when its membership had expanded across settlement boundaries. The association's first annual report was prefaced with the following:

> "The black pepper disease triggered by water damage in 1974, had destructive effects on our farm economy. Subsequent introduction of vegetables and fruits such as melon, passionfruit, and papaya gave us temporary relief. However, our unfavorable, isolated location and disorganized production soon led to economic stagnation. The Friends of Agriculture Association originated from our hopes to establish a sound farm economy through the mastery of agricultural techniques and knowledge..." [Daini Tomé-Açu Nōyūkai 1981]

The Friends of Agriculture Association was a vehicle for participatory agricultural extension, and included subsidies provided by JICA. Extension began with monthly workshops at ***INATAM***, at which researchers and extension specialists from Japan gave lectures. The first field tour

sponsored by ***INATAM*** was held in the ***Zona Bragantina*** (Castanhal, Santa Isabel do Pará, and Guamá settlements) from July 14 to 16, 1980. The tour included 13 Friends of Agriculture Association participants. This group visited farms poineering the culture of papaya, oil palm, lime, coconut, black pepper, poultry, and pig raising. In 1981, this group had 17 meetings, including a lecture by Seiichi Fujisaki about the 3-D Agriculture on July 6, and another talk by Shirō Ōdō (1946-92) about black pepper culture using live-stakes of *Gliricidia sepium* on October 4. Remaining lecture topics ranged from farm management, crops, soil conservation, and plant diseases to a discussion about culture and agriculture. Group members also met with immigrant farmers from the Manaus Friends of the Soil Association (*Manaus Doyūkai*), who visited ***INATAM*** on February 17. [Daini Tomé-Açu Nōyūkai 1981 and 1982]

In the following year, 1982, in addition to the lecture series and three field excursions, the Friends of Agriculture Association began work on crop introductions. Five hundred grafted mangosteen and 2,000 brazilnut seedlings were ordered from ***EMBRAPA-CAPTU***. The group acquired 4,000 seedlings of a new black pepper cultivar called 'Karimunda' from ***CPATU*** and ***INATAM***, with which to do participatory research on disease resistence.

This on-farm research continued in subsequent years with other, newly introduced cultivars. Cotton seeds were contributed by Pará State's Secretary of Agriculture (***SAGRI***) for a planting trial on 10 ha. The group purchased 36.5 kg of guaraná seeds, and received some experimental turmeric stock from ***INATAM***. In 1983, they acquired 330 mahogany seedlings from a nursery of the Brazilian Institute of Forestry Development (***IBDF*** [***Instituto Brasileiro de Desenvolvimento Florestal***]; predecessor of ***IBAMA*** [***Instituto Brasileiro de Meio Ambiente e Recursos Renováveis***]) at Santa Isabel do Pará. They also purchased 82 banana stocks (11 cultivars) from Fazenda Vista Alegre at Agua Branca, Tomé-Açu to be used as shade for cacao plantings.

Various annual crop species were given to the Friends of Agriculture Association from JICA, ***INATAM***, and ***CPATU***. These agencies also introduced Landrace, Large Yorkshire, and Duroc pigs from ***SAGRI***, to establish stock-holding agriculture as a local self-supply source of organic fertilizer. Friends of Agriculture Association meetings increased in frequency to 36 times during 1983. ***INATAM*** also sent four association members to Bahia on a study tour. In 1984, training programs and study tours on farm bookkeeping, biogass generation, vegetable production, mutton breed raising, dairy products, pisciculture, and shrimp culture

were provided by ***CPATU*** and ***INATAM***. In 1985, cupuaçu, puxuri (*Licaria puchury-major*), and rubber tree were added to the list of crops promoted by the Friends of Agriculture Association. From February 21 to March 7, 1985, ***INATAM*** sponsored its last study tour to the Nordeste, which included 31 participants from the Friends of Agriculture Association, ***CAMTA*** and ***ASFATA***. These participants were exposed to ***CEPLAC*** institutions, cacao-rubber based agroforestry systems, and irrigation agriculture practiced in Bahia and Pernambuco. Participants were impressed by the tree crops that had been introduced to coastal Bahia by post-World War II Japanese immigrants, including mangosteen at Una settlement, clove at Ituberá settlement, cinnamon, vanilla and macadamia at Taperoa settlement. [Daini Tomé-Açu Nōyūkai 1983, Tomé-Açu Nōyūkai 1984, 1985, and 1986]

Though ***INATAM*** was closed on June 26, 1985 (see Chapter 3), and absorbed into ***EMBRAPA-CPATU***, the Friends of Agriculture Association continued its activities, thanks to JICA subsidies. Its membership peaked at 34 people in 1986. Propagation of resistant cupuaçu and grafted cacao to treat witch's broom disease were the major achievements of that year. In 1987, the group introduced mammee apple (abricó), and grafted acerola and avocado. In 1988, they grafted mammee apple, and produced rootstocks of sapodilla (*Achras*

sapota), bacripari (*Rheedia macrophylla*), and mundu (*Garcinia Dulcis*) for mangosteen culture. From December 12 to 22, 1988, the Friends of Agriculture Association and ***CAMTA*** jointly conducted an excursion into the Amazon to collect seeds of caju anão (*Anacardium occidentale*), and scions of avocado. The last available annual report of Friends of Agriculture Association was from 1988, after which the group faded out. Its demise appears to have resulted from a change in JICA's subsidy policy. While this remains uncertain, it is certain that JICA transferred its attention to ***CAMTA*** and ***ASFATA***. The former is considered the heart of Tomé-Açu. The latter is charged with Tomé-Açu's infrastructural development and much of its extension work, which also supported farmers who left ***CAMTA*** after the crisis of 1983 (see Chapter 3). In its short history, however, the Friends of Agriculture Association functioned as a core farmer's group, contributing significantly to agroforestry development at Tomé-Açu. Its beneficial impact is still perceptible today, when the Friends of Agriculture Association's membership list is compared with the high quality of those members' farms today. [Daini Tomé-Açu Nōyūkai 1987 and 1988]

Japanese Agroforestry Leaders in the Brazilian Amazon

Ikushima (1960-c) wrote that forests along Amazonian rivers were recklessly felled and that reforestation efforts were few. While encouraging more reasonable natural forest management in Brazil's interior through capital investment, the author stressed economic rationality in selecting locations for such reforestation. Sustained demand for large amounts of raw wood for pulp and paper industries would justify these efforts. US companies established plywood factories at Portel along the Amazon River in 1955, and at Jatobá along the Tocantins River in 1956. The latter factory specialized in processing mahogany. The Brazilian government also began considering tree plantations for logged sites and degraded lands. Ikushima recommended the planting of fast growing species like morototo (*Didymopanax morototoni*), matamata, cedro, and eucalipto. According to Ikushima, these species could be harvested just 12 years after planting. He emphasized the potential for settlements based on reforestation projects. The following section reviews the forest management and reforestation initiatives of Japanese immigrants and organizations in the Amazon.

Masao Nagaoka

Masao Nagaoka (1927-) was born the eldest son in a factory laborer's family in Yamagata City. His father was drafted during World War II and died in Taiwan. Nagaoka was admitted to a commercial high school in 1942, but had to sacrifice his studies to help his mother feed five younger siblings. After the war, he worked as a *sake* brewery employee in Shizuoka prefecture. Returning to Yamagata, he married in 1953 and became a farmer. He cultivated in summer and made charcoal in winter, but was not satisfied with his small farm. He dreamed of moving to Brazil, after seeing a newsreel about the country before the war. Learning through a local newspaper that the first post-war Japanese immigrants had departed for Brazil, Nagaoka went to Yamagata Prefectural Office to obtain more detailed information. He and his family arrived in the Amazon in July of 1954. From there they headed to Rondônia's Treze de Setembro, a federal settlement located 10 km south of Porto Velho, the state capital.

Abiding by their contract with the Brazilian government, they cleared forest and planted rubber, intercropped with upland rice, corn, and cassava. Beginning in the second year, the Nagaoka family planted cucumbers, feijão beans, lettuce, green onions, bell peppers, and

cabbage using seeds purchased in São Paulo. They applied waste obtained from cattle slaughters as fertilizer. To feed many children, their homegarden was filled with local fruit species like oranges, pineapples, bananas, peach palms, coconuts and biribá (*Rollinia deliciosa*). Surplus fruit was sold in Porto Velho. Popular fruit species, such as pineapple, were propagated in their main fields. Mr. Nagaoka planted up to 80,000 pineapple plants. Some of these pineapples were chosen by the Rondônia State for display at the commemorative exposition of Brasilia in 1960. There they received first prize, outcompeting traditional Bahian products. The 30 Japanese immigrant families residing in Treze de Setembro soon produced enough vegetables to saturate Porto Velho's market. In addition, opening the road to São Paulo allowed the import of produce from Japanese farmers in the south of Brazil. Nagaoka and his compatriots then moved into poultry raising, which still had little competition from southern products.

In 1961, Nagaoka participated in the Agriculture Course (*Nōji Kōshūkai*) of the Federation of Overseas Associations. He was impressed by Renkichi Hiraga's (1902-85) lecture, and talked with him all night about reforestation when he visited Tomé-Açu during the field trip. After explaining the complexity of forest ecosystems in the Amazon, Hiraga

listed some promising species for mixed-planting, such as Pau Rosa. After the course, Nagaoka purchased 1,000 ha of interior land, about 500 km from Porto Velho, near the border with Mato Grosso. There he planted vegetables, and mahogany trees over 80 ha. However, these caught fire during the dry season two years later and burned to ashes.

Around 1964, his younger brother, Toshio Nagaoka, was betrayed by a Brazilian he had helped as a guarantor. He was forced to subrogate all the accrued debt, which was equivalent to 10 jeep vehicles of that time. In addition, a careless laborer burned the Nagaoka Farm warehouse, where all the machinery, food and fodder were stored. The Nagaoka brothers were then forced to find jobs in an interior tin mine, where they worked for two and half years. The Nagaoka women and children left behind in Treze de Setembro survived by selling oranges from the trees planted on the farm. When the men returned from the tin mine, they all decided to leave Treze de Setembro. Toshio Nagaoka and his dependents moved to Manaus.

Meanwhile, Masao Nagaoka had heard that there was rich soil in Manicoré, and set out to see this area for himself. For two years he wandered in the interior forests along the tributaries of the Madeira River, planting corn and some food crops in the process. Finally, Nagaoka found a rich

black soil (***terra preta***) on a site having a moderate dry season and little risk of fire. He surveyed 1,600 ha and purchased it. Initially, cassava was planted on swidden fields to produce flour (***falinha***) for shipment to Manaus. He then planted 6 ha of coffee and 20 ha of cacao. Nagaoka farmed during the day, read at night, and kept records of his activities and findings every day for ten years. He found mixed-planting to be the most suitable form of agriculture for the Amazon. His first essay, 'Agricultural Development and Forest Conservation in The Amazon - Regarding These Contradictory Issues (*Amazon no Nōgyō Kaihatsu to Shinrin Hogo - Sono Aihansuru Mondai ni tsuite*)' was published, and a Portuguese translation was submitted to the Amazonas government in June of 1980 (a revised text was published from JICA in 1985; see Appendix B). Nagaoka was then appointed manager of a state forest reserve (6,900 ha) in Manicoré. He stated in his essay:

> "No more than ten years have passed since people first settled along BR 319, the Manaus-Porto Velho road. Impoverished farmers cannot help but slash and burn secondary vegetation repeatedly, for they understand the debilitating labor of weeding if they do not. They eventually give up and move on, abandoning their plots. Only people endowed with capital resources are able to establish themselves as ranchers. Thus, our generation has in the course of a decade converted the primeval forest into pastures and retrograde brush of low productivity. While we may still find primary forest in accessible locations that can be slashed and burned for several cycles of food production, this will not be the case for our children. The Amazon is vast, but not

> limitless. The government has promoted production increases of only short-term crops, which is not a far-sighted policy. We should not, therefore, blame rural residents who do the actual felling of the forest. They do not have sufficient primary education and knowledge of the outside world, beyond the river basins of their birth. The legacy of colonial mercantilism still constrains these people, for they have no dreams beyond that of a wise man saving money to open a small rural business. They have little creativity or knowledge concerning new crops. Therefore, it is the duty of statesmen to introduce the general public to agricultural systems offering them hope for a better future. Government policies should enhance the people's will to work, enabling them to participate in the rational development of the Amazon."

Nagaoka then proposed a rational system of agriculture based on three-storied tree plantations that mimic the structure of natural forests. Starting with cassava culture, a swidden sustains several stages of succession. This eventually leads to a complex architecture of tall trees, middle-sized trees, and understory shrubs, each producing marketable products. He maintained the first criterion of crop selection to be that crops fit easily into existing systems of local agricultural production. If not, severe negative impacts on the natural ecosystem could be anticipated.

The former governor of Amazonas, Gilberto Mestrinho de Medeiros Raposo (term: 1983-87) heard of this eccentric Japanese, and asked to meet him during a campaign trip to Manicoré in July of 1982. The candidate invited Nagaoka to come to Manaus if he won the election. Nagaoka met him

again in the governer's office, and was asked to assist the state's immigration projects. Nagaoka replied that it would be better to do nothing rather than distribute lots to farmers without follow-up agricultural extension. This would only place the impoverished in a situation to destroy forests and the soil for the sake of temporary survival. The governer said he wanted Nagaoka to give proper guidance to such farmers. Nagaoka was immediately posted with the state land bureau (***ITERAM*** [***Instituto de Terras do Estado do Amazonas***]). His official appointment was issued on October 1, 1983, that of a special assistant to the chief. Because of his foreign nationality, the monthly salary was minimal, about US$ 100.

His first task was agricultural extension and seedling production in the new state settlement of Colônia Esperança at Municipality of Novo Aripuanã (project administration was later transferred to the municipality). Nagaoka encouraged 300 colonist families to plant local fruit species in their 60 ha lots. He moved into a local hut to manage a 100 ha demonstration farm of mixed-planting, making short trips to Manaus only once every four months. Seedlings of various species including cupuaçu, peach palm, and oranges were produced for farmers. However, bad timing and insufficient state money delayed the work. Nagaoka ended up carrying

400,000 coffee seedlings from his farm in Manicoré for free distribution. He collapsed twice in the field due to subarachnoid hemorrhaging, but recovered well after taking six months to recover. In 1987, a new Amazonas governer suspended the project, causing most farmers to leave the settlement within a few years. Only the state road between Apuí and Novo Aripuanã, which Nagaoka had proposed for shipping agricultural products from along the Transamazon Highway (***Rodovia Transamazônica*** [*BR 230*]) to Manaus, was realized.

Nagaoka continued to write proposals for sustainable development projects (Appendix B), most of which were dismissed by state politicians and bureaucracies. He was told by his boss that even an approved project would not receive sufficient resources, since few funds would trickle down to the field after being siphoned off by officials handling the budget. Hence, Nagaoka sent his proposals to the Japan International Cooperation Agency (JICA). In 1987, he travelled to Japan with his wife, and visited JICA, the Department of Forestry, and the International Tropical Timber Organization (ITTO). He could not make progress in obtaining support from these organizations, due to the bilateral nature of their project work in Brazil. However, the rubber tappers movement in Acre led by Francisco (Chico)

Alves Mendes de Almeida Filho (1944-88), and Mendes' assassination would change the situation. The Brazilian government hammered out what was called the Our Nature Program (***Programa Nossa Natureza***) in 1988 (Page 1995). ***ITERAM*** changed its name to the Amazonas State Institute of Natural Resources Development and Environmental Protection (***Instituto de Desenvolvimento dos Recursos Naturais e Proteção Ambiental do Estado do Amazonas***) in 1990. ***ITERAM*** then created an extra-departmental body called the Foundation for Advanced Studies in the Humid Tropics (***UNITROP*** [***Fundação para Estudos Avançados no Trópico Úmido***]), in which Nagaoka was appointed an assistant to its president. ***ITERAM*** was dissolved in 1992, due to insufficient state budgetary support.

In 1992, Nagaoka was invited to Rio de Janeiro by a Japanese NGO on the occasion of the United Nations Conference on Environment and Development. There he was disappointed by the fuss over tropical forests, while the interests of rural residents in the Amazon were not even properly represented. In 1994, the Federal Agency for International Cooperation (***ABC*** [***Agência Brasileira de Cooperação***] ***do Ministério das Relações Exteriores***) approved Nagaoka's three development proposals for the Madeira River Basin as one project. However, while the Japan

International Cooperation Agency (JICA) was preparing to undertake an environmental assesment, the project was dropped from the priority list of the Brazilan government.

In 1997, Nagaoka retired from the Secretary of Environment, Science and Technology (***SEMACT*** [***Secretaria de Meio Ambiente, Ciência e Tecnologia***]) of the State of Amazonas. Today, he works as a technical advisor to the Center for Ecological Research (***Centro de Pesquisas Ecolôgicas***), founded by the Japanese Sōka University in 1992. This center is located on a riverbank of the Negro River, near Porto Janjão, in the vicinity of Manaus. Since 1994, Nagaoka has been doing enrichment planting in a 55 ha secondary forest there (see Table 4-7). In 1996, Sōka University purchased 20,000 ha at Novo Aripuanã, and began an initial 50 ha reforestation project. Under Nagaoka's direction, this project is investigating agroforestry, enrichment planting, and natural regeneration techniques. [Yanagihara 1994, Osada 1995, Nagaoka 1995, Satō, S. 1998, Personal observations]

Tomé-Açu Farmers

Noboru Sakaguchi's farm development

Noboru Sakaguchi (1933-) was born in a mountain village in Japan's Wakayama Prefecture. He came to Brazil

Table 4-7. Woody perennial species planted in a secondary forest enrichment project at the Center for Ecological Research, Manaus, Brazil (1998)

Common Name	Scientific Name	# Planted	Non-Timb. Use
Acacia (Acácia)	*Acacia* spp.	17	
Acacia-Manguium	*Acacia mangium*	200	
Acerola	*Malpighia glabra*	38	Fruit
Angico	*Parkia* spp.	670	
Angico-do-Cerrado	*Anadenanthera falcata*	100	
Andiroba	*Carapa guianensis*	200	Seed oil
Bacuri	*Platonia insignis*	3	Fruit
Cabreúva	*Myroxylon peruiferum*	50	
Camu-Camu	*Myrciaria dubia*	100	Fruit
Brazilnut (Castanha-do-Pará)	*Bertholletia excelsa*	600	Nut
Paradise nut (Sapucaia)	*Lecythis pisonis*	9	Nut
Cedro-Vermelho	*Cedrela odorata*	100	
Coração-de-Negro	*Poecilanthe parviflora*	150	
Freijó	*Cordia goeldiana*	10	
Guaraná	*Paullinia cupana*	10	Seed extract
Ipê-Amarelo	*Tabebuia chrysotricha*	1273	
Ipê-Amarelo-da-Mata	*Tabebuia vellosoi*	150	
Ipê-Felpudo	*Zeyheria tuberculosa*	5	
Ipê-Rosa	*Tabebuia avellanedae*	1311	
Ipê-Roxo	*Tabebuia heptaphylla*	647	
Jacarandá-Bico-de-Pato	*Machaerium nyctitans*	400	
Jacarandá-Paulista	*Machaerium villosum*	700	
Jacareúba	*Calophyllum brasiliensis*	10	
Jatobá-do-Campo	*Hymenaea stigonocarpa*	100	
Jequitibá-Branco	*Cariniana legalis*	2000	
Jequitibá-Rosa	*Cariniana estrellensis*	2000	
Juçará	*Euterpe edulis*	100	Palm fruit
Giant Leucena	*Leucaena leucocephala*	1000	Fodder
Louro-Pardo	*Cordia trichotoma*	25	
Mahogany (Mogno)	*Swietenia macrophylla*	1000	
Muiracatíara	*Astronium scleronema*	25	
Muiratinga	*Naucleopsis caloneura*	150	
Mulateiro	*Calycophyllum spruceanum*	120	
Paineira	*Chorisia speciosa*	50	
Paricá	*Schizolobium amazonicum*	610	
Patauá	*Jessenia bataua*	20	Palm fruit
Pau-Brasil	*Caesalpinia echinata*	80	
Pau-Marfim	*Balfourodendron riedelianum*	80	
Pau-Rei	*Sterculia striata*	120	
Pau-Sangue	*Pterocarpus violaceus*	280	
Pau-Terra	*Qualea dichotoma*	250	
Peroba-Rosa	*Aspidosperma cylindrocarpon*	1000	
Pitanga	*Mouriri duckeana*	50	Fruit
Peach Palm (Pupunha)	*Bactris gasipaes*	60	Palm Fruit
Rubber Tree (Seringa)	*Hevea brasiliensis*	50	Rubber latex
Sorva	*Couma utilis*	80	Chicle
Sumaúma	*Ceiba pentandra*	30	Silk cotton
Teak (Teca)	*Tectona grandis*	200	
Tento-Olho	*Ormosia* spp.	100	
Tucumã	*Astrocaryum aculeatum*	50	Palm fruit
Ucuuba	*Virola surinamensis*	17	Seed oil

Source: Shinjirō Satō, assistant (1995-98) to Masao Nagaoka, and Ph.D. student (1998-), SFRC, University of Florida. Tree numbers are cumulative totals planted during 1994-97.

in 1957 after studying forestry at the Tokyo University of Agriculture. Sakaguchi's Bachelor thesis is concerned with '*binchō*' white charcoal, produced at his native village using ubamegashi (*Quercus phillyraeoides*) wood. As a disinherited son, he dreamed of emigrating to the Amazon to become a rubber plantation owner. He was a member of the Japanese Student League for Emigration (*Nihon Gakusei Kaigai Ijū Renmei*), which was founded in 1955. In this organization he was influenced by its chairman, Tadao Sugino (1901-65), a professor at the Tokyo University of Agriculture. During ten months of service as an assistant after his graduation, and before he emigrated, Sakaguchi was encouraged by Sugino's words: "Farm development is an exciting vocation. During 50 years in the course of a man's life he can reproduce the history of 2,000 years, from the year zero (primitive times) to the 20th Century, with his own efforts."

Sakaguchi came to the Amazon aboard a ship that Brazil had ordered from Japan. He worked as a deckhand in exchange for board and transportation, and arrived with US$ 70 to his name. He settled on the farm of a pre-war immigrant named Shigeji Wada (1903-78). It was located next to the former Açaizal Experiment Station of the Japanese Plantation Company of Brazil, near Tomé-Açu Town. There in 1959 he

married (Isaura) Toshiko (Wada) Sakaguchi (1934-), the first daughter of the landlord (***patrão***), and was given a 24 ha lot in front of the Wada Farm on the other side of the high road. Right from the start, he followed the example of Tomé-Açu farmers by planting black pepper. However, the *Fusarium* disease began spreading through the settlement's black pepper by the 1960s, and wiped out his farm by 1969.

In 1970, Sakaguchi was elected as ***CAMTA***'s director in charge of ***ATEA***, and was assigned to select an alternative crop to replace black pepper. He decided on cacao, the tree crop that the Japanese Plantation Company of Brazil had failed to grow successfully. Newly introduced Bahian hybrids grew well with shade trees, thanks to the residual fertilizer on old black pepper plots. The cacao-bean market overheated in 1976, convincing otherwise reluctant farmers to follow Sakaguchi's cacao recommendations. This would significantly change the agricultural landscape of Tomé-Açu (see Agroforestry Development and Supporting Institutions). With his success in cacao planting, Sakaguchi was able to plant a new black pepper field separate from the old infected one. From 1976 to 1979 he intercropped this new black pepper with useful timber species, such as andiroba, parapará (*Jacaranda copaia*), mahogany and mango. In the 1980s, rubber tree and puxuri were also planted in his new

black pepper fields. Today, Noboru Sakaguchi has expanded his farm to 279 ha. It is located between the state road and the Rio Acara-Mirim. Of this total area, 135 ha have been preserved as primary forest, 9.4 ha are extraction primary forests that supply black pepper stakes, 47.1 ha are secondary forest, and 87.5 ha are plantations. The latter includes a 25 ha natural stand of açai palm, growing along a stream (***igarapé***). Non-natural plantations cover 62.5 ha, and include all stages of agroforestry management. Half of this, 30.3 ha, is under canopies of andiroba, parapará, mahogany, eritrina, palheiteira, and sumauma, that reach 20-25 meters in height. [Yanagihara 1994, Sakaguchi 1997, Personal observations]

Noboru Sakaguchi's idea

Sakaguchi became well known as a spokesman for agroforestry at Tomé-Açu. He has received visits from researchers, journalists, and TV crews, both from within Brazil and from overseas. To the frequently asked question as to why he had planted a diversity of tree species in both his homegarden and main field, he answers by citing a lesson he learned from rural residents (***caboclos***).

> "They (***caboclos***) observe the cycle of swidden agriculture by opening 1 ha to plant corn, rice, and cassava for subsistence. They also have 1 ha of gardens around their shelters that are rich in fruit trees and herbs, providing them with a supplementary diet and medicines. They sell only their excess

> production, and are content with a simple life. If a Japanese farmer elaborates on their example and creates a 25 ha garden, then why should not he be satisfied with the fruits it provides?" [Yanagihara 1994, Yanagihara 1995]

Nevertheless, Sakaguchi spoke in personal interviews during 1995-96 of having been inspired by Renkichi Hiraga (1902-85) to plant trees in the Amazon. Though he is not a good writer, Sakaguchi has published an essay as a chapter of the 'International Agricultural Cooperation - Questions and Perspectives from Overseas Contributors (*Kokusai Nōgyō Kyōryoku-ron - Kokusai Kōken no Kadai to Tenbō*)' in 1994. The following paragraphs are a summary of his thoughts.

> "The basis of agriculture is soil development, in terms of both enrichment and physical improvement. However, the Japanese clean culture method based on application of organic matter and lime has been proven ineffective in the Amazon. Weathered and physically poor local soils are dissolved into sand and mud by plowing, and this mud gets washed away in the rainy season, along with all associated fertilizers. In primary forests there is little humus, only a 5-10 cm surface layer under forest litter. This appears strange to farmers familiar with temperate soils. Almost 300-500 t/ha of biomass in primary forests causes confusion as to how tropical soils can sustain such productivity. Leaves and branches that fall during the dry season are completely decomposed by the next rainy season, due to the continuous activity of insects and microorganisms under high temperature and humidity. Plants quickly absorb released nutrients that can not be held long by the poor soils. Hence, the essence of local soil fertility can be considered to be the plant biomass itself.
>
> I (Sakaguchi) categorized local plant succession following slash and burn operations, based on my 35 years of direct experience. The 5th through 7th stages

are assumptions, based on observations of logs at local sawmills.

1st stage (3rd month - 2nd year):
    Gramineae (*Imperata* spp.) Grassland
2nd stage (6th month - 5th year):
    Solanaceae (*Solanum* spp.) / Urticaceae (*Cecropia* spp.) Brush
3rd stage (1st year - 10th year):
    Sterculiaceae (*Theobroma* spp.) Brush
4th stage (2nd year - 20th year):
    Secondary Forest of Various Species
5th stage (10th year - 80th year):
    Climax Secondary Forest
6th stage (40th year - 150th year):
    Transition to Primary Forest with Understory Trees
7th stage (60th year - 300th year):
    Climax Primary Forest

The time limit for swidden field cropping is at most two years, during which secondary succession proceeds due to the activities of all creatures surrounding the swidden. For example, the fruit-eating bats vector seeds of imbaúba and jurubeba, which both play important roles in the 3rd and 4th successional stages. Imbaúba is a plant indicator of good site fertility in a secondary forest that is to be reused for slash and burn agriculture.

Livestock breeding should be adopted in order to provide organic fertilizer. However, recent pasture development covering 100 ha, more commonly covering 1,000-2,000 ha, and even the behemoth 100,000-300,000 ha bank and capitalist operations are not acceptable. Even if land is inexpensive, feeding a 300 kg cow per hectare temporarily in exchange for 300-500 t/ha of forest biomass is outrageous. Such an arrogant meat-eating culture is the fundamental evil causing the destruction that is being wrought in the Amazon. There was no atmospheric pollution at Tomé-Açu until the early 1980s. Since then smoke pollution has progressively increased, becoming intorelable in November-December of 1992. Ranchers not only destroy primary forest, but also inhibit secondary forest growth by the fires they use to clean pastures. Without recovery of plant biomass on a site, the soil degrades rapidly within a few years. There is little law enforcement to control these activities, except in

a few limited areas. The first thing to do to conserve the Amazon's forests is to ban all pasture development activities.

Sawmill owners claim that they are not destroying forests, but merely extracting woods while leaving the greater part of the forest, unlike the clear cutting of ranchers. A climax primary forest consists of layers like superimposed blocks, from understory trees below to emergent tall trees and their associated lianas above. Removal of any of these interdependent elements may lead to the collapse of the entire structure. A decade ago, still carrying many notions of Japanese forestry practice, I (Sakaguchi) carried out a salvage cut of trees and lianas and clearing of undergrowth on 10 ha of primary forest. I initially experienced a transient pleasure with the thinned and more opened forest, but this turned to shame for my ignorance when large residual trees started toppling over. The primary forest is an organic community, a synthesis of its constituent plants, that has developed over several hundred years. Therefore, if people want to use this resource, they should rather develop ways to utilize 100 percent of a limited area. Selective cutting destroys several times the area occupied by the object removed. In addition, local lumber processing yields roughly 50 percent of a log, while the remainder is burned as sawdust and wastewood. This waste should be efficiently carbonized to supply charcoal for the steel, cement and ceramic industries.

I (Sakaguchi) was initially prejudiced against swidden agriculture. Basing this view on my forestry training in Japan, and the forest fires associated with swidden practices I had witnessed, I believed it was absolutely wrong. This notion had to be changed in the Amazon, where 'the forest is soil fertility.' The Japanese clean culture method was found to be far less sustainable than local swidden practices. As for cutting 1 ha out of a 25 ha lot each year, by this method a rural farmer might secure permanent subsistence for his family by clearing secondary forest once every 20 years. In contrast, swidden rotations practiced over intervals of 3 to 5 years in small lots near towns lead to rapid soil depletion. The greatest merit of slash and burn agriculture is that it provides secure yields with less labor input and environmental impacts, and without the use of tillage, fertilizers,

or chemicals. Japanese-style clean culture in the Amazon has meant a continuous battle with weeds for over 60 years. It is sad to witness these unsuccessful challenges to the natural laws of nature, with the introduction of machinery and rotational cropping systems.

Selection of appropriate crops and cultivation methods is crucial in the Amazon. Black pepper serves as a monumental example. Beginning in 1933, the Japanese propagated two pepper cuttings into millions of plants within half a century. They forced individual plants to produce 4 to 5 kg of dry black pepper annually under full sun, in monocultures receiving heavy fertilization. This caused the *Fusarium* disease outbreak: a man-made disaster. Black pepper naturally grows under 50 percent shade as a climber on living trees. Under such natural conditions, pepper production attains at most 2 kg/plant, as reported by Shirō Ōdō, an ***INATAM*** expert. Good judgement and practice is needed to live in harmony with nature, not a conquest by force to establish a permanent agricultural empire in the Amazon. We should humbly learn from nature's examples, and the experience of local people first. Just as Japanese had a traditional agricultural calendar in Japan, Amazonian people also determine the best time for seeding, plant growth, latex extraction, and tree felling according to the phases of the moon. Sometimes we see that local cultural practices work well, but are hard pressed to provide scientific explanations for their success.

International agriculture and forestry cooperation must be based on far-sighted vision and careful feasibility studies. Top-down desk plans from either donors or officials in recipient countries are often useless and even harmful to nature and local people. Thorough research of swidden agriculture systems is needed, primarily to increase food production through crop selection and breeding. Traditional Japanese techniques of *yakitsuchi* (soil roasted for disinfection, for making nutrients available, and for adding pyroligneous acid that would activate beneficial microorganisms), *kuntan* (plant husks carbonized under ca. 300 °C for providing soil with porosity, soluble minerals, and niche of beneficial microorganisms), and paddy field construction may foster soil improvement. Except in staple food cropping areas, long-lived fruit

> tree culture should be encouraged on most soils. Technical cooperation to improve the efficiency of wood use in lumber processing, furniture making, and charcoal production is also needed. Sixty odd years of Japanese struggle to find a 'tree of gold' in the Amazon has left nothing but one lesson: you can see the giant brazilnut and mango trees here and there at Tomé-Açu, that were planted by early immigrants, and produce more fruits each year." [Sakaguchi 1994]

For more than a quarter century Sakaguchi has been encouraging fellow immigrant farmers in Pará and Bahia to plant trees. As a ***CAMTA*** board member (1969-82 and 1985-91; managing director 1979-82), a network of his constituents became established in Japanese settlements where farmers from Tomé-Açu had resettled. In addition, his subordinates from the Tokyo University of Agriculture have assumed leadership roles in different locations, like Monte Alegre, Santa Isabel do Pará, Igarapé-Açu, and Tomé-Açu. Some of these people are working for JICA and ***JAMIC*** branch offices, or for a reforestation project of ***Eidai do Brasil Madeiras S.A.***, a plywood company located at Icoaraci on the outskirts of Belém.

Sakaguchi's basic theory of tree planting is illustrated in the following quotes.

> "The soil of the Amazon is nutrient poor, making its primary role that of supporting the body of trees. However, soils are often shallow, which modifies the spread of roots and affects trunk form and volume. Even tree species that normally have axial roots adapt to shallow soils and themselves become shallow rooted. Under such conditions, some species initially grow tap roots up until they are about 10 years old, and then

form buttresses which increase their diameters. Others, even emergent tree species, have dominant lateral roots that produce an analogous aboveground form without straight trunks. Hence, soil condition is the first criterion in selection of tree species. In addition, adaptation to the water table and seasonal flooding should also be considered when planting is done in lowlands, like ***varzea*** and ***igapó***.

The criterion that determines tree planting distance and planting combinations is light preference. Sun trees are fast growers that can tolerate full sunlight on their leaf surfaces. There are many sun-tolerant species in the Amazon that grow straight for more than 20 m without branching. These species often have large leaves attached to their trunks by long petioles. Most palm species are in this category. Shade-tolerant trees are not adapted to receive direct sunlight. Though not many timber species are in this group, shade-tolerants are nevertheless important constituents of the middle and low layers of primary forests. So-called neutral trees include those species that do not tolerate full sun in their early stages of life, but become sun trees as they grow. Many emergent species in primary forests are in this category.

The essential idea of 'Forest Farming' (*shinrin nōgyō*) is to reproduce a simplified organic structure of primary forests, and then derive partial production from it. Site location, shade tolerance, production output, and access to markets are all considerations in the selection of tree species. In general terms, an ideal forest is comprised of four strata: 1) canopy trees, which are mostly neutral trees, are shade-tolerant trees through the 4th stage of forest succession, and become sun trees as they overtop their neighbors and grow to heights of 30 to 45 m; 2) medium trees, which are a mix of sun trees and shade-tolerant trees that germinate during the 2nd and 3rd stages of succession, and grow to heights of 15 to 30 m; 3) low trees, which are shade-tolerant trees that grow 5 to 10 m tall, some of which eventually die due to insufficient sunlight while others grow up to the upper forest stratum; and 4) forest floor vegetation, which includes miscellaneous species of lichens, ferns and bamboos that grow 0 to 5 m tall. This vegetation is important for microorganisms, insects, and animals living on the forest floor.

> Potential species for tree farming include: canopy trees like brazilnut, paradise nut (*Lecythis pisonis*); medium trees like cedro, andiroba, mahogany, balsa (*Ochroma pyramidale*), and teak (*Tectona grandis*); low trees like cupuaçu, cacao, and coffee; and forest floor vegetation like black pepper, vanilla, cardamom, and cinnamon (*Cinnamomum zeylanicum*). Other potential species yielding products like fruit, latex, medicine, wood, and charcoal include: maçaranduba, piquiá, copaíba (*Copaifera reticulata*), rubber tree, uxi (*Endopleura uxi*), bacuri, and palms like oil palm, coconut, açai, peach palm (*Bactris gasipaes*), and tucumã (*Astrocaryum aculeatum*). Many palms yield fruits for human consumption or pigs left to roam beneath managed forests." [Sakaguchi 1977]

Finally, as a student and enthusiast of charcoal, Sakaguchi explored its role in secondary forest succession, swidden agriculture, and forest farming. On three different occasions between 1994 and 1996, Sakaguchi invited charcoal experts from Japan to attend training courses organized for farmers. Sakaguchi recalled the good harvests of sweet potatoes and vegetables at his home during and after World War II, achieved through the application of *funnyō kuntan* (mixed and carbonized rice husks and manure at around 300 °C), *fuseyaki kuntan* (carbonized husks under soil cover), and *kunjōdo* (smoked soil). These were used because commercial fertilizer was not then available. Sakaguchi has continued this practice over the 40 years since he settled at Tomé-Açu. [Sakaguchi, N. and Sakaguchi, T. 1996]

> "I (Sakaguchi) have had few root-knot nematode problems in my garden over the years. I have used little fertilizer or chemical sprays. Powdered charcoal left in sacks functions like deodorant in bathrooms or in

livestock barns for 3 to 4 months, and then works more effectively than ammonium sulphate when applied to vegetable plots. In local swiddens, Brazilian farmers indicate the locations where their crops grow well by saying: "this is a site where a carneseca tree grew" or "this is a place where we gathered debris and burned it." Powdered charcoal is always found at such sites, places where both crops and tree seedlings grow well. Even in 10 to 15 year old secondary forests, powdered charcoal is tightly covered by fine roots beneath leaf litter, fostering vigorous tree growth. This is due to the porosity of the charcoal, which provides habitat for *Azotobacter, Rhizobium* spp., and vescicular arbuscular (VA) mycorrhizal fungi. These microorganisms assist tree growth by making available nitrogen, phosphorus and minor elements. Therefore, poor chemical and physical characteristics of tropical soils are ameliorated by the presence of charcoal. I have two pots containing 16 year old black pepper vines near the entrance to my house, both of which once suffered blight. A housemaid accidently threw residual charcoal from a stove into these pots. After a week the withering stopped, and three weeks later the decayed plant bases dried up, exposing a callus that was already growing. From the 1940s to 1950s black pepper at Tomé-Açu was healthy, probably because farmers collected burned surface soil, including charcoal and ash, and put this into planting pits. This practice stopped when machinery was introduced to do soil preparation work, and the mass *Fusarium* infestation of the 1970s was quick to follow. In 1996, I followed the old methods of black pepper culture when planting 1,000 black pepper plants, adding charcoal from bamboo, coffee husks, saw dust, and bones to the pits. I await results from this trial." [Sakaguchi 1997]

Noboru Sakaguchi and andiroba

Sakaguchi was initially interested in rubber tree. In 1959, he introduced 3,000 seedings, obtained from the Goodyear Farm at Igarapé-Açu (Sakaguchi, N. and Sakaguchi, T. 1996). These were distributed at Tomé-Açu, but only a few of them survived. The Tomé-Açu Sangyō Kumiai (1961b)

mentions roadside rubber trees at Quatro Bocas, planted there by Renkichi Hiraga (a few of these remain near the entrance to ***ACTA***), and a total of 500 trees on the Oshikiri (Arraia), Iwama (Breu 4-6), Wada (Açaizal), and Seki (Ipitinga) Farms. However, the agricultural cooperative was skeptical about the rubber culture promotion being done by the Federation of Overseas Associations (*Kaikyōren*) during that period. This was because of the time and investment required for grafting and weeding over many years until latex tapping can begin. In the mid 1960s, the Amazon Rubber Tree Cultivation Project (***Projeto de Heveicultura da Amazônia***) of the Brazilian government opened a nursery at Oshikiri Farm (Arraia Lot No. 57) to produce 300,000 grafted rubber tree seedlings. These were ready for free distribution by 1967 (Tomé-Açu Sangyō Kumiai 1967). However, Sakaguchi did not plant rubber again until 1973, and only took up serious planting in 1982.

Sakaguchi became more interested in andiroba for its medicinal and wood uses. He received his first andiroba seeds from Mataichi Kinoshita (1896-1965), of Quatro Bocas, in 1963. Kinoshita was an innovative farmer (*tokunō*) who first produced Amazon cabbage (see Chapter 3), and was eager in tree planting. The seeds had been collected from a mother tree of unknown provenance that had itself been

planted by the Japanese Plantation Company of Brazil in the 1930s. Observing andiroba's good initial growth in his homegarden, Sakaguchi ordered more seeds for a foreman (***capataz***) of his seasonal black pepper laborers from Cametá. This is how 7,000 trees were planted over 14 ha in 1976. Japanese farmers at Tomé-Açu had started paying attention to Sakaguchi after his windfall from cacao, and quickly followed his example. However, they became discouraged by andiroba's vulnerability to fire, slow wood growth, and the tedious processing of its seed oil for a limited market. [Sakaguchi, N. and Sakaguchi, T. 1996]

> "Japanese immigrants at Tomé-Açu are rather akin to other animals foraging beneath the forest canopy. These human animals, however, continuously ran about among understory and forest floor plant species, foraging for money. They have ignored the law of natural ecosystems, unaware that the mantle of taller forest trees protects life down below. After 68 years since immigrants first arrived, venerable brazilnut trees still survive here and there. The Japanese Plantation Company of Brazil encouraged farmers to study tree germination techniques of brazilnut by offering them prizes. The company also planted blazilnut seedlings in cacao plantations. These trees present their yellow flowers next to their previous year's immature fruits. They collectively look down upon us and wonder: "don't you yet understand?"" [Sakaguchi 1977]

Saburō Katō, Akio Shioya and mahogany

A pre-war immigrant, Saburō Katō (1906-85), introduced mahogany seeds to Tomé-Açu during the 1953-56 period. The seeds were brought back from his several trips to Maués and

Parintins, Amazonas, from where he also brought back guaraná seedlings. Two of his original mahogany trees survive on the edge of a secondary forest at the Katō Farm of Boa Vista District (Lot No. 49). In 1996, the larger of the two was 28 m tall, had a DBH of 105 cm, and was quite forked due to repeated shoot tip borer attacks during its early growth. There are five other original mahogany trees at Arraia District. Four of these grow on the Shioya Farm (Lot No. 5), and were 25 m tall, with DBHs of 46-63 cm. All four trees have unforked, straight trunks. According to Akio Shioya (1937-), the five mahogany trees were planted by the farm's former owner, a Japanese called Mr. Kamada, in the early 1960s. Whether they are genetically related to the Katō Farm trees is unknown.

When Shioya came to Tomé-Açu in 1957, local Brazilians were entering Arraia via streams (***igarapés***) to extract timber. They processed sawlogs into lumber on site and bound planks into rafts to transport them. Some locals carved canoes from sawlogs, which Shioya often enjoyed watching. By the time Shioya became economically independent in 1961, all valuable local timber was gone. He cleared the forest to plant black pepper, which was claimed by *Fusarium* disease like everywhere else. Since he did not want to see the land return to brush, Shioya grew seedlings

(except cacao), and outplanted brazilnut (1967), cacao (1970), cupuaçu (1972), peach palm (1975), açai (1980), and limão. This made Shioya one of the pioneer planters of these tree crops at Tomé-Açu. Later his wife, Mitsuko Aoki Shioya (1942-), undertook commercial production of açai juice at her home at Quatro Bocas Town. Early farmers who have more recently planted peach palm to yield hearts of palm (***palmito***), purchased their seed from the Shioya Farm.

In the dry season of 1974, the Shioya family moved to Quato Bocas to continue their children's educations. They purchased 0.35 ha in an urban area that was suitable for poultry, vegetable gardening, and a tree nursery. Their land at Arraia was left in the care of a Brazilian caretaker, while the owners still visit occasionally. For several years, beginning in December of 1974, the Shioyas raised about 1,000 mahogany seedlings at their home from seeds collected at Arraia. They planted 800 of these in the cacao field on Arraia Lot No. 2, which is located along the Acará-Mirim River. The remaining trees were distributed in lots of a few to several dozen, and in later years in the form of seeds, to the following: Shūji Furumoto (1937-96, planted on Agua Branca Lot No. 76); Kōji Suzuki (1940- , Mariquita Lot No. 230); Milton Hiroji Seki (1938- , Ipitinga Lot No. 35); Yōichirō Kimura (1931- , Agua Branca Lot No.

113); Kazumi Matsuyama (1930- , Arraia Lot No. 448); (Cesar) Hiroshi Hosokawa (1929- , Arraia Lot No. 55); Noriaki Arai (1937- , Breu 3-7 Lot No. 479); Tsuneharu Oneta (1941- , Breu 3-7 Lot No. 324); Toshio Matsunaga (1915- , Breu 5-8 Lot Nos. 175 and 176); Kōzaburō Mineshita (1939- , Concórdia do Pará), etc. The Shioyas told these recipients that mahogany was highly prized in the United States for pianos and to make coffins for movie stars, and that they should also immediately start making prepartions for their own mahogany coffins. People took this statement half-seriously, and planted the trees near their homes. Many of these grew well, soon becoming a seed source for propagation during the 1990s 'reforestation boom' among Japanese immigrants. [Katō, K. 1996, Shioya 1995 and 1996, Personal observations]

Osamu Kondō, Seiya Takaki and brazilnut

Osamu Kondō (1940-78) was born at Monte Alegre as the eldest son of Hideo Kondō (1912-). His father was the youngest member of the Ōsaka YMCA Amazon Development Youth Group (see Chapter 3) under Renkichi Hiraga (1902-85), and had come to Tomé-Açu in 1952. At his home lot, Arraia Lot No. 56, Hideo Kondō grew the first local example of rubber and cacao mixed-planting on 19 ha from 1965 to 1973. Vanilla was added to this mix in 1986. Osamu Kondō was active as chairman of the Nisei Association of Tomé-Açu

(***ANBTA*** [***Associação Nipo-Brasileira de Tomé-Açu***]) in the 1970s, and organized construction of the Nisei Hall (*Nisei Kaikan*) at Quatro Bocas, and the Niseikai Pool at Agua Branca (see Chapter 3). He owned lots at Breu 3-7 District along Estrada Bom Jardim (Lot Nos. 516, 518, 520, 522, 524, 526 and 528 of Anauerá), and commuted 16 km there by tractor along bad dirt roads from Arraia. In 1971, Kondo planted 620 brazilnut trees, with eritrina and palheiteira planted as shade trees in a 14 ha stand of cacao. After his premature death, these lots were sold to a *nisei* farmer Seiya Takaki (1958-) at Breu 4-6 District Lot No. 461. The latter is the eldest son of a successful post-war immigrant, Tetsuo Takaki (1931-), from Breu 4-6 District Lot No. 469. The elder Takaki grew 38 ha of cacao, 31 ha of rubber, 7 ha of cupuaçu, 3 ha of acerola farms, and also did trial planting of cedro branco, freijó and andiroba in his cacao fields. Seiya Takaki has maintained his farm at Anauerá well, as thick leaf litter covers the ground under the surviving 580 brazilnut and 6,300 cacao trees. Eritrina and palheiteira have already been suppressed by the dense canopy of brazilnut that reaches 23-26 m above ground. Ten brazilnut trees randomly measured there had DBHs ranging from 52-72 cm. Takaki stores brazilnut fruits in a slatted wooden box beside his house, until the seeds within absorb

sufficient water to germinate, breaking their woody nut shell (***casca***) and fruit shell (***ouriço***). Brazilnut seedlings yield fairly well with little labor. They have been planted in combination with black pepper, rubber, and cupuaçu at other locations. Takaki's home lot (Breu 4-6 Lot No. 461) looks like a 22 ha showcase of agroforestry, having from 1984 to 1996 planted a mix of soursop, cupuaçu, mahogany, rubber, cacao, coffee, freijó, cedro branco, brazilnut, bacri, andiroba, ipê, passionfruit, and pueraria. Another 10 ha at Breu 3-7 District (Lot No. 528; different from the former Kondō lot) has from 1982 to 1995 been mixed-planted with rubber, cacao, freijó, and brazilnut. Takaki's tree planting efforts seemed to inspire resourceful *nisei* farmers like Francisco Masashi Miyagawa (1959-) from Breu 4-6 No. 462, and Valter Tadayuki Oppata (1967-) from Breu 4-6 No. 182. The common feature among this successor generation of agroforesters is their parents' experience in nursery stock (i.e., seedlings, cuttings, and grafted young trees) production. This preceeding generation had already test grown various tree species for their fruits, medicines and wood, and had demonstrated 20-40 years of planting results to their children. [Personal observations and communications]

José Maria Yōithi Numazawa and freijó

José Maria Yōithi Numazawa (1942-) claimed that he was the first Japanese farmer to plant freijó as a shade tree for cacao at Tomé-Açu. Numazawa was born in Belém, but his family returned to Tomé-Açu after Japanese immigrants were assaulted in the city during August of 1942 (see Chapter 3). Beginning in 1972, he invested a portion of his assets from black pepper culture in 45,000 freijó trees. These trees were first planted in home lots Breu 1-2 Lot Nos. 160 and 161. In 1975, Numazawa planted a 60 ha pasture in Mariquita Estrada Ubim s/n that was dominated by quicuio da Amazônia (*Brachiaria humidicola*) with 30,000 freijó trees, planted at 3 m X 3 m spacing. However, he could not properly take care of them, and the field grew into a secondary forest. In 1992, he again cleared this field for pasture, while also planting it with paricá (*Schizolobium amazonicum*) seeds at 20 m X 20 m spacing. These seeds did not germinate. In 1994, he planted leucaena (*Leucaena leucocephala*) seeds there at 3 m X 3 m spacing, but these were eaten up by his cattle (he was planning to try this again in 1996, applying 6 kg of seeds to a fallow pasture).

Numazawa planted the cacao field at Breu 1-2 Lot Nos. 160 and 161 (home lots) with 10 acapu seedlings in 1975, and 100 cedro vermelho seedlings in 1980. The former did not

grow at all, and most of the latter died when the cacao trees were felled and burned. Today, Numazawa has only 1,450 freijó trees on his farm, since he has sold some cacao fields shaded by freijó in Breu 4-6. There the freijó trees grew straight to 5-10 m in height, then branched to form a canopy 20-23 m high. They are healthy-looking when mixed-planted with other tall trees, such as palheiteira. But the freijó trees are not healthy when cacao trees are their only companions. Though ultimately unsuccessful himself, Numazawa contributed to the popularity of freijó at Tomé-Açu by demonstrating their good initial growth in cacao stands, and by providing seeds and seedlings to others. [Numazawa 1996, Personal observations]

Gilberto Kōichi Taketa and paricá

Gilberto Kōichi Taketa (1949-) is the eldest son of Takeshi Taketa (1922-), who was ***CAMTA***'s board member during 1957-69 and 1973-83 (executive director 1957-69, president 1978-79). The elder Taketa came to Tomé-Açu in 1933, accompanied by his ***colono*** parents. In 1936, the family moved to the Senator Álvaro Adolfo Farm in Belém (which is currently ***CPATU***), and produced charcoal and vegetables there under its manager, Haruichi Morikawa (1907-78). Morikawa was an ex-member of the Ōsaka YMCA Amazon Development Youth Group, and a pioneering vegetable grocer. The Taketas

became independent horticulturists in 1940, but returned to Tomé-Açu after the assaults on Japanese in August of 1942. There they were forced to begin again as farm laborers. Renkichi Hiraga (1902-85) hired Takeshi Taketa to assist in ***CAMTA***'s accounting section in 1953. Gilberto Kōichi Taketa studied on his own and graduated from what is today the Federal University of Paraná (***Universidade Federal do Paraná***), majoring in forestry. He first worked for the ***IBDF*** in Belém, then for cacao and black pepper agents, until becoming financially independent. José Maria Yōithi Numazawa recalled visits of Gilberto Kōichi Taketa to his farm during the early 1970s, in order to obtain freijó seedlings for the ***IBDF*** nursery (Numazawa 1996). In 1976, Gilberto Kōichi gave terminalia (*Terminalia amazonia*?) and mahogany seeds to his father, who resided at Boa Vista Lot No. 24. Takeshi Taketa planted terminalia over 1 ha, but replaced these with black pepper and acerola, concluding there was little hope of selling them. Only seven mahogany trees survive today. Ten terminalia trees, which probably came from the Taketa Farm, were found at Breu 4-6 Lot No. 290 (J. Itō Farm) in 1996. These grew straight to 26 m above the ground, had no branching to 23-24 m due to self-pruning, and had DBHs of 45-73 cm, with mean DBHs of 59 cm.

In 1981, Gilberto Kōichi obtained paricá seeds. His father planted them at 5 m X 5 m spacing at his home. At present, 100 of these trees provide shade to the nursery. Another 2,000 trees were planted on a 5 ha cacao farm at Marupaúba Lot No. 150. However, this lot was sold during the crisis of 1983 (see Chapter 3), to help cover the ***CAMTA***'s severe deficit. Today, this lot belongs to Elson Kōichi Satō (1971-) who lives at Boa Vista Lot No. 415-A. It still has 500 paricá trees, which were thinned by a former Brazilian owner.

Takeshi Taketa distributed paricá seeds and seedings to Yūichirō Shibata (1930-) at Mariquita Lot No. 93, Takeshi Itō (1923-) at Breu 4-6 Lot No. 290, Hamilton Makoto Wada (1938-) at Breu 5-8 Lot Nos. 55 and 56, Julião Kenji Endō (1955-) at Breu 5-8 Curva Grande Lot Nos. 9 and 10, and Takurō Maki (1947-) at Cuxiu Lot No. 2-241. Most of these were planted as shade trees for cacao. At the farms of Shibata (320 trees over 5.8 ha), Itō (35 trees over 2.0 ha), and Wada (50 trees over 2.5 ha), paricá canopies attained 30-40 m in height. Sample DBHs from the Shibata Farm ranged from 44-65 cm (8 trees), 55-77 cm (8 trees) at the Itō Farm, and 34-80 cm (10 trees, planted in 1983) at the Wada Farm. One isolated two-year-old volunteer tree at the Wada Farm was 16 m tall and had a DBH of 14.7 cm. Yūichirō Shibata

received visits from the Paragominas-based plywood company, ***Floraplac*** (Shibata 1995). In 1995, Floraplac converted a 500 ha pasture to a fertilized paricá plantation having 350,000 trees. In 1996 its subsidiary at Tomé-Açu Town, ***Amazonplac***, purchased 4 trees from the Taketa Farm (7 m^3 @ R$ 23 ≒ US$ 23/m^3) and 13 trees from the Shibata Farm (30 m^3 @ R$ 26.67 ≒ US$ 26/m^3) for trial processing (Shibata 1996). On January 16, 1997 the Vale do Rio Doce Company (***Companhia Vale do Rio Doce***) sent seven forestry engineers to the Shibata Farm (Shibata 1997).

This author missed the opportunity to interview Gilberto Kōichi Taketa, but he was apparently interested in fast growing trees with straight trunks, that could be planted by farmers in their agroforestry plots. Gilberto Kōichi presented the paper 'Practical Experience with Mixed-Planting of Perennial Plants at the Municipality of Tomé-Açu, Pará' (***Experiências Práticas de Consórcio com Plantas Perenes no Município de Tomé-Açu, Pará***) for the 'Symposium on Mixed-Planting Production Systems for Permanent Development of Soils in the Amazon' (***Simpósio sobre Sistemas de Produção em Consórcio para Exploração Permanente dos Solos da Amazônia***) held by ***EMBRAPA-CPATU Convênio GTZ*** in Belém from November 19 to 20, 1980. After listing typical mixed-planting methods for black pepper and cacao culture,

Gilberto Kōichi stated:

> "The combination of black pepper, cacao, and freijó seems promising. Many different spacings have been tried, yet no definite one is preferred. Freijó has a large variety of development and branching behaviors, often losing apical dominance to enlarged lateral branches. Selection is needed to improve bole form and self pruning characteristics. Regularly lopped *Erythrina* may help improve bole form and self pruning of freijó, while providing moderate shade for cacao." [Taketa, G. 1982]

Since 1994, Gilberto Kōichi Taketa has been encouraging his father to plant teak. Takeshi Taketa was preparing 20,000 teak seedlings for rainy season outplanting in 1997. Also, a black pepper and cupuaçu mixed-planting field trial in 1995 yielded fair results. [Taketa, T. 1995 and 1996, Personal observations]

Tomio Sasahara's agroforestry

Tomio Sasahara (1939-) was born in a small tenant farming family in a mountain village of Japan's Yamagata Prefecture. He was the third boy among nine siblings. After graduating from a local junior high school, he went to Tōkyō looking for employment. However, the Japanese economy had not yet recovered from the war, forcing him to do a variety of menial jobs. For an allowance of ¥ 100 (US$ 0.28) and a bean-jam bun, he joined the mass demonstrations against the 1960 Treaty of Mutual Cooperation and Security between the United States and Japan (*Anpo Jōyaku* [*Nichibei Sōgo Kyōryoku oyobi Anzen Hoshō Jōyaku*]). Frustrated by a

stifling society and his poor urban existance, he answered an advertisement promoting emigration to the Amazon.

Sasahara came to Tomé-Acu by himself in 1960, and worked as a ***colono*** at Arraia District for three years to master black pepper culture. By winning one of the first lots at Daini Tomé-Acu, he became financially independent, acquiring Ipiranga Lot No. 1-07 in 1963. There he planted 1,000 black pepper vines with a loan from ***JAMIC***. He gradually enlarged this plantation. In 1970, he borrowed money from ***CAMTA*** to plant more black pepper before *Fusarium* disease would arrive at his farm. However, the disease came in 1973, that was quickly followed by water damage in 1974. His pepper production decreased from 18 tons (t) in 1973, to 7 t in 1974, and then 1.5 t in 1975. He explored alternative cropping options with Renkichi Hiraga (1902-85), who was then living at nearby Ipiranga Lot No. 1-91 with his adopted son, Tamio Itō (1941-). Hiraga told Sasahara:

> "Human life is short regardless of one's way of living. We take nothing from this world, and we leave very little here. If you struggle for money and live improperly, your life is meaningless. More important than money is harmonious human relations. However, if I had had a child, I would have troubled myself as you do now."

Sasahara regretted his over-indulgence in black pepper, and decided to leave trees for children, as Hiraga was always saying. Sasahara remembered the landowner at his

birthplace in Yamagata, cutting just four old sugi trees to send his daughter to college. Tanio Oshikiri (1911-87; ***CAMTA*** president 1957-69 and 1973-77) had also suggested that Sasahara plant two rows of brazilnut trees on his farm boundary as fire breaks and a future wood supply. Oshikiri was a respected senior immigrant from Yamagata Prefecture. He invited Sasahara to his home for New Year feasts, and showed him huge brazilnut trees (Figure I-14 of Appendix I) in Arraia Lot No. 59 left there by his father in law Enji Saitō (1891-1958).

Following Hiraga's advice on planting methods, Sasahara began with brazilnut in 1973. Various other tree species were later interplanted with the brazilnuts. He grew seedlings himself, with the exception of cacao and rubber tree. At the instruction of Hiraga, Sasahara went to see Saburō Katō (1906-85) at Boa Vista and Akio Shioya (1937-) at Arraia to obtain mahogany seeds. Most other tree species he acquired from ***INATAM*** and through the activities of the Friends of Agriculture Association (*Nōyūkai*). Besides those species listed above, by 1996 Sasahara had planted 25 ha with a mix of mammee apple, andiroba, avocado, bacri, uxi, cedro vermelho, cupuaçu, freijó, ipê amarelo (*Tabebuia serratifolia*), jacarandá da bahia (*Dalbergia nigra*), macacauba, morototo, paradise nut, pau rosa, peach palm,

piquiá, sapodilla, sapota (*Matisia cordata*), teak, and ucuuba (*Virola surinamensis*). Sasahara also grafted mammee apple (abricó), avocado (using scions from Ceará, Pará, and Paraná), cacao (using scions of the Kusano Farm at Mariquita), cupuaçu, sapodilla, and uxi.

His neighbors initially considered him to be mad. Extension workers from ***CEPLAC*** advised him that he would receive no further loans if he refused to plant eritrina and palheiteira. Sasahara sent them away saying that he preferred to do his 'reforestation shading' of cacao, and would never ask for financing again. In the 1980s, high officials from the Para State's Secretary of Agriculture (***SAGRI***) visited Sasahara's farm, having heard of successful 'reforestation.' They scolded the extension agents for having interrupted a master '***japonês***' farmer.

Since then, Sasahara has received many interested visitors from Brazil and overseas. In 1987, he responded to questions in a ***CAMTA*** interview about his '3-D agriculture' by stating:

> "Before the assumed retirement age of 60, I hope to establish a farm adapted to the natural environment of the Amazon. I'd like to have a comfortable life, not by forcing plants into more production, but by picking up the fruits they give me. Pigs and hens can also be fed from what falls to the forest floor."

The brazilnut trees planted in 1973 were 30 m tall, and had DBHs from 60-70 cm (5 samples) by 1996. They were already

producing fruits. Freijó trees from 1979-80 were 15-22 m tall, with DBHs varying from 13-34 cm (20 samples). Freijó looked much healthier when mixed-planted with other tall tree species than when alone, as predicted by Renkichi Hiraga. Cacao production decreased in the shade, but weeds, water sprouts, and witch's broom also decreased there.

Sasahara's mixed-planting has influenced neighbors like Mitsuzō Ōnuki (1925-) of Ipiranga Lot No. 1-17, (Jorge) Shigueo Takahashi (1951-) of Ipiranga Lot No. 1-20, Rokusono Uwamori (1913-) of Ramal 0 Lot No. 290, Yasuaki Matsuzaki (1950-) of Ipiranga Lot No. 2-15, and Sasahara's son-in-law, Francisco Masashi Miyagawa (1959-), of Breu 4-6 Lot No. 460.

The Takahashi Farm introduced a mahogany provenence from Conceição do Araguaia in 1977. It arrived as seed from Takahiro Takahashi (1954-), a brother of (Jorge) Shigueo, and a wood processing engineer. By 1996, 40 trees of this South Pará provenance in a cacao field (mixed-planted in 1978) had reached 24-25 m in height, and had DBHs of 40-61 cm with a mean of 50 cm (12 samples). These mahognany trees were producing seeds, and from them 1,700 more seedlings were planted in cacao and rubber plantations. The Takahashi Farm had 80 ha in agroforestry management, which included brazilnut, cedro, freijó, ipê, macacauba, morototo, piquiá,

sucupira (*Bowdichia* spp.), ucuuba, rubber tree, and various fruit tree species. Takahashi said, besides lessons of Renkichi Hiraga (1902-85) and Tomio Sasahara (1939-) on tree planting, he was taught by his mother (Maria) Haru (Abe) Takahashi (1921-) of a traditional idea of Japanese farmers, called '*tomo-sodachi*' (Takahashi 1995). This means, one (plant or animal, including human) may grow better in a group or a community, rather than being alone. [Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1987b, Sasahara 1995a, 1995b, 1996a, and 1996b, Agro-Nascente 1996d, Personal observations]

Takurō Maki's agroforestry

Takurō Maki (1947-) was born the son of a factory laborer in Japan's Ibaraki Prefecture. He came to Tomé-Açu in 1967 by himself, after graduating from high school and from an emigration training course in Japan. He worked as a ***colono*** for Tanio Oshikiri (1911-87; ***CAMTA*** president 1957-69, 1973-77), and studied Portuguese with Osamu Hoshino (1906-96), a former staffer of the Japanese Plantation Company of Brazil who was then living at Boa Vista Lot No. 23. Having read a document in Oshikiri's library about pre-war tree plantation experiments at Tomé-Açu and Castanhal, Maki asked Hoshino his opinion about local wood production using reforestation. Though many tree species were grown in his homegarden, Hoshino was not very encouraging. He told about

the parasite species erva-de-passarinho (*Phthirusa* spp.), that had ruined the trees of the Japanese Plantation Company of Brazil.

Until the 1970s, there were no mechanically equipped lumberjacks (***madeireiro***), but rather woodmen (***serradores***) who sawed a limited number of species by hand. These included louro-amarelo (*Ocotea* spp.), louro-vermelho (*Ocotea rubra*), quaruba (*Vochysia* spp.), freijó, marupá, cupiuba (*Goupia glabra*), pau-amarelo, and acapu. Hard woods like angelim (*Dinizia excelsa* and *Hymenolobium excelsum*) and ipê (*Tabebuia* spp.) were difficult for hand sawing, and considered useless (even obstacles to farm development), except for the hard charcoal they left after burning. Thus, several valuable timber species were quickly becoming depleted in forests that were still densely stocked.

Maki thought that appropriate forms of agricultural management should change according to the age of a farmer. Forestry seemed viable as his final goal, for it required less intensive labor. Maki asked Renkichi Hiraga's (1902-85) advice. Hiraga suggested that, before planting trees, Maki should carefully observe local forests which consisted of 300-400 plant species per hectare. In 1969, Maki purchased Cuxiu Lot No. 2-241 and became financially independent. In 1973, he married with Etsuko Ōnuki Maki

(1950-), a daughter of Mitsuzō Ōnuki (1925-), who was a forester from Yamagata Prefecture and a former ***colono*** of Tanio Oshikiri.

Beginning in 1974, Maki and Ōnuki together planted freijó trees in declining black pepper stands. Plentiful wild tree seedlings were found in nearby forest gaps. From 1975 to 1977, they visited the ***IBDF*** at Santa Isabel do Pará to obtain free tree seedlings. Officials there informed them of reforestation loans, which were limited to firms that employed Brazilian forestry graduates. In reality, those firms planted trees only as statistical records (see Masao Nagaoka), not in the ground. Maki wanted to plant 100 ha, but had few resources. He visited the newly established Forestry Department at ***EMBRAPA-CPATU*** and asked for assistance. Researchers there had been frequenting the Maki Farm to observe freijó trees (Eden 1982), but proved unable to help Maki.

Meanwhile, a Brazilian government poster that encouraged reforestation appeared. Maki made inquiries at the agencies listed on the poster, along with Yūichirō Shibata (1930-) and Seiji Tsutsumi (1936-). They combined these visits with a trip to receive their Saburo Chiba Settlement land titles (see Chapter 3). But they found that the National Institute of Colonization and Agrarian Reform

(***INCRA*** [***Instituto Nacional de Colonização e Reforma Agrária***]) and the Pará State Land Institute (***ITERPA*** [***Instituto de Terras do Pará***]) had no actual reforestation programs. An ***EMBRAPA*** representative said that only freijó seeds were available, and that those came from the Maki Farm at Daini Tomé-Açu. Maki was also shipping freijó seeds to Manaus at the request of ***JAMIC***.

Ōnuki and Maki had even attempted artifical pruning of freijó, ordering pole pruners from Paraná. However, clipped trees became stunted within ten years, receiving damage from wood-boring beetles and other unidentified die backs. Other species they had planted like cedro, mahogany, marupá, and macacauba were, however, growing well as of 1996. By that year, Maki had created 40 ha of orchard with various fruit and timber tree species. According to Maki, cupuaçu trees growing under moderate shade from freijó and macacauba had longer and more evenly distributed production than trees on other farms that received full sun.

Other planting trials of Maki included louro-vermelho germinated in a nursery, and 1,000 wild seedlings of pau-amarelo collected at the Saburo Chiba Settlement. These were planted in the black pepper field at Cuxiu Lot No. 2-241, and grew well there during the rainy season. They died, however, during the following dry season. In 1976, he

line planted a secondary forest with 1 m spacings of andiroba, freijó, gmelina (*Gmelina arborea*), and ucuuba. While the former two species died, the latter two survived well.

After 20 years of experience, Maki has concluded that reforestation in the Amazon should be initiated with fast growing white wood (***pau branco***) species as shade trees, such as in cacao cultivation. These fast growers can soon be harvested for wood pulp, veneer, concrete shuttering, and fruit boxes. Premium hardwood (***madeira de lei***) species grow well under appropriate levels of shade during their initial years. Seed sources for these species are often unexpectedly close, if one pays close enough attention to newly opened fields, forest gaps, homegardens, and parks. Besides, one could ask his farm laborers to find local tree seeds when they return home. A laborer from Cametá recently brought Maki sucupira amarela (*Hymenolobium pulcherrimum*) seeds. Maki was against monoculture plantations of currently popular teak and paricá, that would provide little food and habitat for wildlife and might have other drawbacks, as happend with freijó. In 1996, he was raising copaiba, jatobá (*Hymenaea stigonocarpa*) and genipapo (*Genipa americana*) seedings from locally obtained seeds, at the recommendation of an ***INATAM*** expert, Shirō Ōdō (1946-92).

These species are relatively easy to grow and have market promise in fine woodcraft, such as music instrument construction.

Maki's neighbors Masanobu Maeda (1937-) of Cuxiu Lot Nos. 2-262 and 2-263, Hideo Kawamura (1949-) of Cuxiu Lot No. 2-254, Hiyoshi Tsubaki (1911-) of Cuxiu Lot No. 2-259, Kunimitsu Ōnishi (1933-) of Cuxiu Lot No. 2-243, and Tikara Kaminosono (1939-) of Cuxiu Lot No. 2-253 also created agroforestry farms of fruit and timber trees. [Maki 1995a, 1995b, and 1996b, Personal observations]

Other educated *nisei* and *sansei* agroforesters

There are two *sansei* (third generation) foresters at Tomé-Açu. Osvaldo Ryōhei Katō (1956-) is a grandson of the black pepper pioneer Tomoji Katō (1898-1956), and chief of the Forestry Sector of ***EMBRAPA-CPATU*** in Belém. Osvaldo Ryōhei sent various fruit and timber tree seeds/seedlings to his father, Lauro Kunizō Katō (1926-), at Boa Vista. Lauro Kunizō planted these in his homegarden and black pepper fields. His farm is surrounded by pasture and sawmills, making fires during the dry season routine. Lauro Kunizō has had the experience of losing trees planted by Tomoji Katō (see Agroforestry Development and Supporting Institutions). Since none of his three sons will take over

the family's 300 ha farm, Lauro Kunizō plans to sell it after his retirement (Katō 1996).

Wildberto Jōji Kimura (1962-) is a ***FCAP*** forestry graduate. He is a grandson of Sōichirō Kimura (1905-63), who was an influential ***CAMTA*** director (term 1939-57, executive director 1946-57) during the Black Diamond Era. Wildberto Jōji was the only participant from Tomé-Açu among 15 people invited to visit the teak plantation of ***Cáceres Florestal S.A.*** at Cáceres, Mato Grosso in April of 1994. The visit was organized by the Pan-Amazônia Japanese-Brazilian Association (***Associação Pan-Amazônia Nipo-Brasileira***) in Belém. He brought back teak seedlings and seeds, and distributed them to farmers for trial planting. While busy taking over management of the former cooperative supermarket at Quatro Bocas in mid-1994, Wildberto Jōji still managed to begin tree planting in 1995. He did this planting with his friend, Getúlio Kazuyuki Sasaki (1964-), an ***FCAP*** agronomy graduate and a permanent staffer of ***CAMTA***. Actual nursery and field management was done by both of their fathers, Yōichiro Kimura (1931-) and Yūkō Sasaki (1937-), who planted 400 trees on 0.3 ha, and 1,600 trees on 1 ha, respectively.

Finally, the Japanese settlements in Pará produced four other forestry and agroforestry researchers from the ranks

Table 4-8. Multi-purpose trees (MPTs) planted on Japanese-Brazilian farms at Tomé-Açu as of 1996

Common Name	Scientific Name	# Trees
Acacia	*Acacia* spp.	8
Acapu	*Vouacapoua americana*	35
Ameixa	*Eugenia cumini*	2
Andiroba	*Carapa guianensis*	21657
Bacuri	*Platonia insignis*	447
Baru	*Dipteryx alata*	106
Biribá	*Rollinia deliciosa*	20
Brazilnut	*Bertholletia excelsa*	5648
Breadfruit	*Artocarpus incisa*	83
Caja & Tapereba	*Spondias* spp.	57
Candlenut	*Aleurites moluccana*	55
Cedro	*Cedrela odorata*	879
Cedro Branco	*Cedrela huberi*	188
Copaiba	*Copaifera* spp.	100
Cuiarana	*Buchenavia grandis*	62
Cumaru	*Coumarouna odorata*	320
Cutite	*Pouteria macrophylla*	7
Eucalyptus	*Eucalyptus* spp.	11
Fava Maputigui	*Macrosamanae pediallare*	18
Freijó	*Cordia goeldiana*	33073
Genipa Fruit	*Genipa americana*	15
Gmelina	*Gmelina arborea*	1800
Guarana de Caroço	?	5
Guinea Chestnut	*Pachira aquatica*	160
Ipê	*Tabebuia* spp.	4021
Jacarandá da Bahia	*Dalbergia nigra*	63
Jacarandá do Pará	*Dalbergia spruceana*	397
Jackfruit	*Artocarpus integrifolia*	707
Jatobá	*Hymenaea stigonocarpa*	2
Jutaí Açu	*Hymenaea courbaril*	49
Jutaí Mirim	*Hymenaea parvifolia*	60
Leucaena	*Leucaena leucocephala*	586
Louro Vermelho	*Ocotea rubra*	2
Macacauba	*Platymiscium ulei*	1252
Mahogany	*Swietenia macrophylla*	8884
Mammee Apple	*Mammea americana*	1097
Mango	*Mangifera indica*	1260
Marang	*Artocarpus odoratissima*	520
Marupá	*Simarouba amara*	2
Morototo	*Didymopanax morototoni*	5
Neem	*Azadirachta indica*	8
Paradise Nut	*Lecythis pisonis*	27
Parapará	*Jacaranda copaia*	302
Paricá	*Schizolobium amazonicum*	1378
Pau Brasil Falso	*Adenanthera pavonina*	4
Pau Ferro	*Machaerium* spp.	1
Pau Rosa	*Aniba rosaeodora*	14
Pine	*Pinus* spp.	11
Piquiarana	*Caryocar glabrum*	1
Piquiá	*Caryocar villosum*	91
Pitomba	*Talisia esculenta*	1
Puxuri	*Licaria puchury-major*	971
Sabiá	*Mimosa caesalpiniaefolia*	140
Sapodilla	*Achras sapota*	341
Sapota de Solimões	*Matisia cordata*	2
Sassafras	*Ocotea cymburum*	10
Sendan	*Melia azedarach*	5
Sucupira	*Bowdichia* spp.	20
Sumauma	*Ceiba pentandra*	70
Tamarind	*Tamarindus indica*	10
Tatajuba	*Bagassa guianensis*	132
Teak	*Tectona grandis*	3291
Tento Amarelo	*Ormosia paraensis*	42
Terminalia	*Terminalia amazonia* ?	10
Ucuuba	*Virola surinamensis*	211
Uxi	*Endopleura uxi*	42
unidentified & other trees		33
Total		90831

Table 4-8--continued
Note: Numbers of trees are summed over 233 farms. However, many owners still omitted homegarden trees (mostly minor species in the table). Specialized fruit trees and rubber tree are not included. The same is true for cacao shade trees like eritrina and palheiteira. Assuming that two-thirds of surviving shade trees are positioned at 12.5 m X 12.5 m spacing, then about 100,000 shade trees existed over 2,293.5 ha of the settlement's cacao fields. See Appendices E, F, G and H for planting year, area planted, and planting methods for each MPT species.

of *nisei* and *sansei*: Alfredo Kingo Oyama Homma (1947- , grandson of Ryōta Oyama) and Armando Kouzō Katō (1949-) of ***EMBRAPA-CPATU***, and (Orlando) Sueo Numazawa (1951-) and Selma Toyoko Ōhashi (1957- , daughter of Paulo Toshio Ōhashi) of ***FCAP***. These researchers studied Tomé-Açu agroforestry systems in collaboration with Brazilian and international researchers, thereby contributing to development of agroforestry in the Amazon. Multi purpose trees (MPTs) used for agroforestry by Tomé-Açu farmers are listed in Table 4-8. [Kimura, Y. and Kimura, W. 1996, Eida 1997, Personal observations]

Group Reforestion Initiatives

Eidai do Brasil Madeiras S.A. - Belém

Eidai do Brasil Madeiras S.A. (***EDB***) began operations on July 21, 1973 at Icoaraci, Belém. It was a joint venture involving the Eidai Co. Ltd., a manufacturer of wooden

products and housing materials in Japan, and Mitsubishi Corporation's lumber division. The new company produced plywood, blockboard and particle board. During its first decade of operation, Brazilian law prescribed the planting of 4 trees for each 1 m^3 of sawlogs harvested. This planting requirement could either be done by ***EDB*** itself, by coordinated projects of reforestation companies, or by paying taxes to a federal reforestation fund. ***EDB*** did most of this obligatory reforestation itself. The largest of these projects occurred at Portel from 1976-85, where 1,050,000 trees were planted over a 460 ha clear cut, and another 1,200,000 trees were planted on a 680 ha selectively cut site (Table 4-9). In 1985, the Brazilian government began requiring sustainable forest management plans as a requirement for obtaining logging permits. These plans needed to include rotational cutting cycles longer than 20 years, and the performance of enrichment and forest-gap planting after tree felling operations. ***EDB*** planted 490,000 ucuuba seedlings on a total of 400 ha at Breves, Anajás and Gurupá (Table 4-9).

Since 1991, the Brazilian government has made felling regulations even more strict, through encouragement from international advocates of tropical forest protection. ***EDB*** recognized the need for a stable future wood supply from

Table 4-9. Forest management done by ***Eidai do Brasil Madeiras S.A.*** in the Brazilian Amazon (1974-98)

Location	Total Area	Natural Regen.	Enrichment Planting	Reforest-ation	Planted Years
Corporate Properties	ha	ha	ha (10^3 trees)	ha (10^3 trees)	
<Pará>					
Icoaraci, Belém*[1]	253		100 (160)	20 (220)	1974-98
Colônia Jambuaçú, Igarapé-Açu	220			200 (300)	1994-98
Tauari, Garrafão do Norte*[2]	1,551			220 (138)	1997-98
Curupati, Viseu	5,000	5,000			
Aramã, Anajás (Marajó)	6,500	6,300	20 (30)		1994-96
Arapijó, Breves (Marajó)*[3]	3,000	2,500	180 (190)	170 (370)	1985-96
Piarim, Portel	33,000	5,800	682 (1,198)	462 (1,050)	1976-85
<Amazonas>					
Mamuru, Parintins*[4]	3,000	1,900			
Badajós, Codajás	4,300	4,300			
Juruá, Itamarati	26,000	25,000		5 (9)	1995-98
Sub Total	*82,824*	*50,800*	*982 (1,578)*	*1,077 (2,087)*	
Contracted Logger Properties					
<Pará>					
Paraiso, Anajás (Marajó)	452	452	20 (25)		1991
Cunhantão, Anajás (Marajó)	4,000	4,000	100 (119)		1988-90
Pedra, Anajás (Marajó)	5,460	5,000	50 (60)		1993-96
Padaria, Gurupá	800	800	15 (25)		1992
Sub Total	*10,712*	*10,252*	*185 (229)*		
Grand Total	93,536	61,052	1,167 (1,807)	1,077 (2,087)	

Source: Satō, Tak. (1998). The three major planted species are paricá on 420 ha, Caribbean pine (*Pinus caribaea*) on 340 ha, and ucuuba on 100 ha. Other species include: teak, balsa, fava (*Parkia* spp. & *Piptandenia* spp.), andiroba, brazilnut, piquiá, mahogany, sumauma, marupá, etc.

*[1] Factory and timber yard site. Here, 20,000-30,000 seedlings have been produced annually for research and Arbor Day events. Major nursery for reforestation is located at Colônia Jambuaçú, Igarapé-Açu.

*[2] Preparing 150,000 saplings of paricá, fava, balsa, teak, mahogany and brazilnut for reforestation of 200 ha of degraded pasture during the rainy season of 1999.

*[3] Growing 120,000 ucuuba saplings as of 1998 for enrichment planting at tree felling sites in Anajás.

*[4] Planting in preparation.

plantations. Appropriate species, planting methods, disease and pest control, and reforestation costs needed study urgently. During that period, the Mitsubishi Corporation became a major target of conservationists opposed to its

Sotheast Asian timber exports to Japan. The company created a special division to address this criticism, and began a reforestation survey in Sarawak, Malaysia. Dr. Akira Miyawaki (1928-), a professor emeritus from Yokohama National University and Director of The Japanese Center for International Studies in Ecology (JISE) was invited to join this project. He initiated dense mixed-plantings of more than 100 tree species, the so-called Miyawaki Method, to accelerate establishment of natural-looking tropical tree plantations. Except for close planting spacement (ca. 20 cm X 20 cm), the idea of Dr. Miyawaki seemed similar to what is called 'Multiple Species Plantations (MSPs)' in India, studied by Flickinger (1997).

Encouraged by Mitsubishi, ***EDB*** launched a similar research project in collaboration with ***FCAP***, providing fellowships to forestry students. On May 22, 1992, just prior to the Earth Summit in Rio de Janeiro, ***EDB*** organized the first Arbor Day Festival at Icoaraci. Local officials and students were invited to plant tree seedlings following the Miyawaki Method. From that time until 1997, a total of 360,000 seedlings of 100 species was planted over 12 ha at 7 locations in Belém, Breves, Igarapé-Açu, and Garrafão do Norte. In 1992, ***EDB*** also began a joint study of ucuuba with the Rio de Janeiro Federal Agricultural University (***UFRRJ***

[***Universidade Federal Rural do Rio de Janeiro***]). Ucuuba seeds from 182 mother trees in 16 Amazonian locations were collected, and 6,000 seedlings were planted at experimental sites in Belém, Breves, and Igarapé-Açu in 1993 and 1995. Besides this, 766 trees in a 17-year-old plantation at Portel were selected as seed trees in 1995. Seedlings derived from these trees were expected to achieve 25 percent more wood production than seedlings grown from randomly collected seeds. Meanwhile, a reforestation experiment on degraded pasture was launched at Igarapé-Açu in 1993. A combination of 80 percent Paricá and 20 percent other species were mixed-planted after mechanical site preparation of 200 ha (Table 4-9). The same protocol was reproduced at Garrafão do Norte on 220 ha during 1997-98, yielding favorable initial results.

Until recently, there have been little formal business contact between ***EDB*** and Japanese immigrant communities, aside from public donations. However, this author believes that ***EDB***'s presence has been key to motivating Japanese farmers to plant trees. For example, a group of people from Cuxiu District at Daini Tomé-Açu (called '*Sekisei-Kai*') approached ***EDB***'s president in the mid 1970s, asking him to finance their pasture development project by purchasing felled forest timber. This plan was felt to be economically

unviable, so the president recommended planting a teak plantation instead of doing pasture development. He promised to send teak seeds from Southeast Asia (Kaminosono 1996). This promise went unfulfilled, when sudden illness forced ***EDB***'s president to return to Japan. Nevertheless, ***EDB*** did continue to accept visitors to their factory facility and reforestation site at Icoaraci. Its employees in charge of forest management and reforestation were Takushi Satō (1947-), a Tokyo University of Agriculture graduate, and Nobuo Ezawa (1939-), a former agricultural immigrant who arrived in 1961. These two supported the establishment of the Amazon Forest Study Group (***CEFLAM***) at Tomé-Açu.

In reflecting on ***EDB***'s 25 years of experience, Takushi Satō (1998) wrote that they were initially preoccupied only with fulfilling legal obligations, and planted whatever seeds they could easily acquire. Moreover, manual weeding and thinning of seedlings were insufficient, so that outplanted trees did not grow sufficiently to permit harvesting after 20 years. Enrichment planting efforts also produced unsatisfactory results due to inadequate tending, especially in management of canopy light. ***EDB*** now expects that timber extraction costs from natural forests may further increase with a toughening of government

regulations, and more distant transportation from interior forests. In contrast, degraded pasture is increasing in Pará, where available mechanization can lower reforestation costs. Fast growing trees, ideally a mix of paricá (60%) and other species (40%) can be planted to produce harvestable timber in 18 years, and at less cost than extraction from natural forests. Moreover, this could be a way to make a corporate contribution to environmental conservation of the earth. [Eidai do Brasil Madeiras S.A. 1995, Satō, Tak. 1998, Personal observations and communications]

CEFLAM - Tomé-Açu

The first collective reforestation initiative among farmers at Tomé-Açu began in 1980, in the form of a community forest (*kyōyūrin*) of Daini Tomé-Açu Village Association (*Daini Tomé-Açu Jichikai)*. The resident's association received a land donation from ***JAMIC***, and planted 530 brazilnut trees covering 10 ha there. They had a plan to create a 200 ha brazilnut plantation, in order to finance the association's activities with brazilnut sales. Residents took care of this orchard for several years, but did not continue this maintenance for long after the withdrawal of ***JAMIC*** (see Chapter 3). On September 7, 1991, the Amazon Forest & Culture Study Group (***CEFLAM*** [***Centro de***

Estudos Florestais da Amazônia] = *Amazônia Shinrin Bunka Kenkyūkai*) was founded at Quatro Bocas. It was officially registered as a Brazilian non-profit private organization on February 13, 1992. ***CEFLAM***'s first chairman was Ítalo Cláudio Falesi (1932- , term 1991-93), chief of the Soil Science Division of ***EMBRAPA-CPATU***. About half of ***CEFLAM***'s 40 promoters were Japanese immigrants, which included farmers, businessmen, and JICA staff. The original idea for ***CEFLAM*** came from Kazumi Watanabe (1961-), a Tokyo University of Agriculture graduate and a JICA volunteer ('*Kaihatsu Seinen*' or literally 'Development Youth') at ***CAMTA***. Watanabe had longed to come to Brazil after graduation, and was posted on southern ranches for several years after his arrival. However, he was more interested in the forest tribes of northern Brazil, stemming from his enthusiasm for mysterious ancient cultures. Learning that a post was available at the oldest Japanese settlement in the Amazon, Watanabe moved there and met an older alumnus from his university, Noboru Sakaguchi (1933-), the guru of 'Forest Farming.' Learning about the 60 year experience of Tomé-Açu farmers and their agroforestry practices, Watanabe became inspired with the idea that these Japanese could contribute to a new forest civilization in the Amazon. The prospectus of ***CEFLAM*** states:

> "Nature conservation has become one of the most critical issues for the human race. Particularly, rapid depletion of tropical forests is causing environmental degradation, decrease of wood and genetic resources, and a crisis among indigenous cultures. We love the Amazon, the world's largest tropical forest, where we live and work. We would like to achieve an affluent society through industrial and social activities that are in harmony with nature."

CEFLAM outlined a 10-year plan (1993-2002) that includes: primary forest reservation and phenological studies, a wood sample museum and seed tree farm, secondary forest enrichment using line planting, an agroforestry databank and demonstration farm, silvopastoral management consulting, an urban tree-planting campaign, local wood processing development (woodworking, sawdust compost and charcoal making), product marketing, and ecology study tours (natural forests and agroforestry). From June 1 to 14, 1992, ***CEFLAM*** participated in the Earth Summit NGO Global Forum in Rio de Janeiro, as one of three local NGOs from the Brazilian Amazon. It exhibited photo panels of the history of Tomé-Açu (furnished by ***ACTA***), tropical fruits produced at Tomé-Açu (***CAMTA***), and ethnographical research from the Negro River Basin in Amazonas (Emílio Goeldi Museum = ***Museu Paraense Emílio Goeldi***). Seedlings of 20 local Amazonian timber tree species (***EDB***) were displayed. From June 8 to 10, 1992, ***CEFLAM*** gave three presentations on development and

indigenous people of the Amazon in the ***Eletrobras*** Conference Room.

Through that event, ***CEFLAM*** established contact with environmental NGOs, indigenous groups, and interested municipalities in southern Pará and Mato Grosso. It also established relations with the Foundation for Education, Science, Technology, and Protection of the Environment (***Fundação Brasil/Japão de Artes e Educação*** = *Kyōiku Kagaku Gijutsu Kankyō Hogo Zaidan*), the 'second Japanese-Brazilian environmental NGO after ***CEFLAM***,' which is based in Brasilia. In 1992, ***CEFLAM*** received at Tomé-Açu 19 NGO representatives and journalists who participated in the Global Forum, and 12 researchers from Brazil and Japan. In 1993, it purchased teak seeds from a plantation company ***Caceres Florestal***, Caceres, Mato Grosso, as well as 12 local timber species (see species listed in Table 4-10, plus jatobá and ucuuba) from the ***SUDAM***'s forestry experimental station (***Estação Experimental de Curuá-Una***) at Prainha, Pará. Germination work began on December 17, 1993 at the ***ASFATA*** nursery at Daini Tomé-Açu.

In 1993, ***CEFLAM*** liaison offices were opened in Mato Grosso and Yokohama. From September 9 to 10, 1994, ***CEFLAM*** sponsored the Forest Environment Seminar of Acará-Araguaia

Basin '94 (***Seminário '94 sobre Estudos Florestais da Basia Acará-Araguaia*** = *Acará-Araguaia Ryūiki Shinrin Kankyō Seminar '94*) which attracted 152 participants from Belém (50 people), the upper Araguaia and Tocantins Basin (30 people), and Tomé-Açu. The seminar was co-sponsored by the Emílio Goeldi Museum, ***EMBRAPA-CPATU, SUDAM, FCAP***, Federal University of Mato Grosso (***UFMT*** [***Universidade Federal do Mato Grosso***]), Araguaia Basin Ecology and Culture Foundation (***Fundação Eco-Cultural do Vale do Araguaia***), Foundation for Bananal Island, and the Araguaia and Xingu Rivers (***BAX-Ecologia*** [***Fundação Bananal Araguaia e Xingu***]), and the Andorinhas Hills Foundation (***Fundação Serra das Andorinhas***). Financial support came from the Nature Conservation Society of Japan (NACS-J), Pará State, the municipalities of Tomé-Açu, São Felix do Araguaia (southern Pará), and Barra do Garças (Mato Grosso). Local industries located at Tomé-Açu and Belém, including banks, tourism and wood businesses, also made contributions. Fourteen seminar presentations discussed: forest ecosystems of the Amazon, indigenous people and their culture in the forest, environmental conservation, the role of NGOs, eco-tourism, agroforestry, wood processing and waste wood utilization, and the agricultural development history of Tomé-Açu.

During the rainy season of 1995, ***CEFLAM*** had 8,000 one-year-old tree seedlings, germinated at the ***ASFATA*** nursery, distributed to interested farmers for field trials. A portion of the seedlings was saved for a reforestation study of a degraded pasture of quicuio da amazônia, as well as line planting under gmelina trees obtained from the Jari Project (Table 4-10). It was a joint research initiative with Luciano Carlos T. Marques of ***EMBRAPA-CPATU***, who initiated a silvopastoral experiment at Paragominas in 1984. This research received additional technical advice from Dr. Tetsurō Taniyama, an ecology professor of Mie University, Japan.

From October 11 to 17, 1996, ***CEFLAM*** sponsored a training course about multi-purpose utilization of charcoal and its by-products. Three charcoal experts came to Tomé-Açu, led by Ginji Sugiura (1925-), vice chairman of *Kokusai Sumiyaki Kyōryoku Kai*, a Japanese NGO working on charcoal-related technologies. Sugiura had retired from the Forestry and Forest Products Research Institute (FFPRI = *Shinrin Sōgō Kenkyūjo*) of the Japanese Ministry of Agriculture, Forestry and Fisheries. At the Sakaguchi Farm, course trainers constructed two kilns that could utilize agricultural wastes, waste wood and saw dust. A modified Brazilian kiln that could utilize waste wood was also built at the

Table 4-10. ***CEFLAM*** reforestation experiment on degraded pasture at Daini Tomé-Açu (1995)

Common Name	Botanical Name	Origin	Planted Seedlings mm/10d	#trees	avg.height	Dry Season Survival (10/31) sur.%	est.#trees	avg.height	Per month ht. growth
Tatajuba	*Bagassa guianensis*	Curuá-Una	04/late	131	(cm) 71.7	17	22	(cm) 13.0	(cm) -
Piquiá	*Caryocar villosum*	*CPATU*	06/mid	35	23.4	0	0	-	-
Cumaru	*Dipteryx odorata*	*CPATU*	06/mid	35	22.1	71	25	23.1	0.23
Fava-Maputigui	*Macrosamanae pediallare*	Curuá-Una	06/early	33	20.0	56	18	15.6	-
Jacarandá-do-Pará	*Dalbergia spruceana*	Curuá-Una	04/late	175	21.7	82	144	24.3	0.43
Jutaí-Açu	*Hymenaea courbaril*	Curuá-Una	05/mid	88	93.9	50	44	122.3	-
Jutaí-Mirim	*Hymenaea parvifolia*	Curuá-Una	04/late	53	97.4	94	50	106.7	1.55
Paricá	*Schizolobium amazonicum*	Tomé-Açu	06/mid	36	26.9	0	0	-	-
Tento-Amarelo	*Ormosia paraensis*	Curuá-Una	06/early	72	22.5	44	32	22.8	0.06
Andiroba	*Carapa guianensis*	Tomé-Açu	05/early	53	100.0	64	34	104.1	0.72
Mahogany	*Swietenia macrophylla*	Curuá-Una	04/late	159	73.1	78	124	75.1	0.33
Cuiarana	*Buchenavia grandis*	Curuá-Una	06/early	70	72.9	89	62	79.2	1.35
Morototó	*Didymopanax morototoni*	Curuá-Una	05/late	8	28.3	14	1	24.0	-
Freijó	*Cordia goeldiana*	Tomé-Açu	05/mid	140	25.0	28	39	30.6	-
Teak	*Tectona grandis*	Mato Grosso	06/mid	35	8.8	100	35	11.5	0.28
Ipê-Amarelo	*Tabebuia serratifolia*	Curuá-Una	04/late	281	31.3	100	281	38.9	1.27
Baru	*Dipteryx alata*	Mato Grosso	06/late	173	19.5	61	106	24.0	1.13
Leucena	*Laucaena leucocephala*	*CPATU*	06/late	240	81.8	100	240	77.0	-
Jacarandá-do-Pará	*Dalbergia spruceana*	Curuá-Una	07/07	10	20.7	100	10	21.9	0.32
Jutaí-Açu	*Hymenaea courbaril*	Curuá-Una	07/06	10	45.7	20	2	50.5	-
Mahogany	*Swietenia macrophylla*	Curuá-Una	07/07	10	40.6	10	1	87.0	-
Ipê-Amarelo	*Tabebuia serratifolia*	Curuá-Una	07/06	10	32.7	100	10	33.7	0.27

Source: CEFLAM (1996). The ***CEFLAM*** Experimental Field covers 35 ha. The site was a part of an ***INATAM*** experimental field, slightly sloped, and situated on the ***Latosol Amarelo Podzólico***. The pasture was planted in 1974 and abandoned for more than 10 years. Before this study, secondary bush was cleared by fire to assist recovery of dominant grasses. Tree seeds were obtained from the ***SUDAM Estação Experimental de Curuá-Una, CPATU*** in Belém, Tomé-Açu farms, and Mato Grosso. Paricá seedlings were volunteers growing under mother trees in cacao fields, and Piquiá trees were rooted cuttings. The first 16 timber species were planted in 8 lines (18 trees each), and 36 lines (35 trees each). The second two fodder species were planted in 18 lines (31 trees each). Each line was occupied by the same species, which was randomly chosen based on seedling availability. Distance between trees was 3 m, and between lines was 3 m, skipping 11 m after every forth line. The third 4 timber species were planted in 2 lines (20 trees each; consisted of 2 species, planted separately) within a *Gmelina arvorea* grove next to the pasture for comparison.

furniture factory of Ricardo Fagundes (1957-), a ***CEFLAM*** board member.

According to Kokusai Sumiyaki Kyōryoku Kai (1995), 46 Tomé-Acu sawmills produced 2,200,000 m^3 of lumber, and 1,480,000 m^3 of wood waste annually during the early 1990s. An estimated 250,000 m^3 of this was recycled to produce at most 100,000 m^3 of charcoal, leaving 1,230,000 m^3 of wood waste, which was burnt to ash. ***CEFLAM*** organized a seminar for all interested parties, and recommended the production of charcoal and pyroligneous acid for agricultural use, such as a soil improvement additive and livestock dietary supplement. It demonstrated an experiment of charcoal application to vegetable seedlings at the Sakaguchi Farm, showing slides of how charcoal promotes root growth of fruit and timber tree species. Tomé-Açu farmers immediately began collecting waste charcoal from kilns at local sawmills. Resourceful farmers purchased charcoal regularly, to the extent of 5,000 sacks (90 t, or US$ 5,300) on one farm. Three old farmers, Sakuji Ono (1923-) of Breu 5-8 Lot No. 104, Toragorō Sasaki (1926-98) of Ipiranga Lot No. 1-22, and Shinobu Kubota (1934-) of Cuxiu Lot No. 2-219, had forestry experience from Japan and built traditional black charcoal kilns with local clay to collect pyroligneous acid.

Meanwhile, people's interest in timber tree planting increased considerably. A preliminary commiittee was formed on July 23, 1996 at the ***ACTA*** Hall, involving the participation of five Japanese organizations at Tomé-Açu (***CEFLAM***, ***ACTA***, ***ASFATA***, ***CAMTA***, and ***COERTA***). This author was asked to survey the entire community to record past land uses, agricultural activities, and trees that had been planted. Based on the results of this survey, it was resolved that a community reforestation project should be established. [Daini Tomé-Açu Jichikai 1984, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, CEFLAM-Amazônia Shinrin Bunka Kenkyūkai 1992, Amazônia Shinrin Bunka Kenkyūkai 1993, Amazônia Shinrin Bunka Kenkyūkai 1994, Amazônia Shinrin Bunka Kenkyūkai 1995, Amazônia Shinrin Bunka Kenkyūkai 1996, Agro-Nascente 1996c]

Monte Alegre Educational Forest Park - Monte Alegre

The Earth Summit in 1992 and ***CEFLAM***'s environmental programs had an impact on Japanese settlements in Pará. At Monte Alegre, the Monte Alegre Japanese-Brazilian Cultural Association (***Associação Cultural Nipo-Brasileira de Monte Alegre*** = *Monte Alegre Nippaku Bunka Kyōkai*) launched a project called Monte Alegre Educational Forest Park (***Horto Florestal Educativo de Monte Alegre*** = *Monte Alegre Kyōiku Rin'en*) in 1993. An 18 ha upland (***terra-firme***) lot on the

outskirts of the town was donated by the municipality of Monte Alegre. The goal was to establish a demonstration farm based on sustainable tropical agriculture, applying cover crops, green manure, compost, charcoal, pyroligneous acid, roasted soil, mixed-planting and agroforestry practices. Half of this lot area became a reservation of local ***serrado*** vegetation, and received supplementary planting of tree species subject to overharvesting for fuelwood. Technical advice was solicited from the ***Museu Emílio Goeldi*** in carrying out this species recovery planting. An agricultural library and an educational workshop for processing tropical fruits, fish, meat, leather, wood and ceramics were also planned. Eco-tourism was also listed as an eventual goal. The association held monthly study meetings, at which agroforestry became a major discussion topic during 1994. When this author visited in January of 1995, a seed tree orchard was being planted, with help of volunteers from Holland. It contained both local and exotic species (see Table 4-11). An experimental flat-type kiln (*hiraro*) used to carbonize agricultural waste had also been constructed.

The association's chairman, Yasuo Kishi (1941-, term 1992-97), a Tokyo University of Agriculture graduate, wrote in a prospectus that the purpose of the Educational Forest

Table 4-11. Arboretum of the Monte Alegre Educational Forest Park, as of January 1995

Common Name	Botanical Name	# Varieties
<Fruit>		
acerola	*Malpighia glabra*	5
araticum	*Annona montana* var. *margravii*	1
ata	*Annona squamosa*	1
atemóia	*A. squamosa* x *A. cherimola*	1
avocado	*Persea americana*	1
pineapple	*Ananas comosus*	3
camu-camu	*Myrciaria dubia*	1 *[1]
cashew	*Anacardium occidentale*	2
carambola	*Averrhoa carambola*	1
cupuaçu	*Theobroma grandiflorum*	1
jackfruit	*Artocarpus heterophyllus*	1
mango	*Mangifera indica*	7
orange	*Citrus* spp.	18
palm	*Bactris gasipaes* (spineless), etc.	3
papaya	*Carica papaya*	2
passionfruit	*Passiflora edulis*	1
soursop	*Annona muricata*	1
tamarind	*Tamarindus indica*	1
<Spice & Medicine>		
black pepper	*Piper nigrum*	5
cumaru	*Coumarouna odorata*	1
guaraná	*Paullinia cupana*	1
vanilla	*Vanilla fragrans*	1
<Other Trees and Bamboos>		
ipê amarelo	*Tabebuia serratifolia*	1
ipê branco	*Tabebuia roseo-alba*	1
ipê roxo	*Tabebuia avellanedae*	1
jatobá	*Hymenaea stigonocarpa*	1
rubber tree	*Hevea brasiliensis*	4
sabiá	*Mimosa caesalpiniaefolia*	1
sumauma	*Ceiba pentandra*	1
bamboo	*Dendrocalamus* spp., *Phyllostachys* spp., *Bambusa* spp., etc	15*[2]

Source: Personal observations and communications. Plant collection started in 1987 by the Monte Alegre Japanese-Brazilian Cultural Association. The Monte Alegre Educational Forest Park became an independent NGO in 1997.
*[1] seeds from Masao Nagaoka in Manaus.
*[2] 7 species/varieties from Southeast Asia, 7 from Japan and 1 from Brazil.

Park was to allow local people to directly 'observe and experience' issues of environment and development, so that such issues become more than mere abstractions. Kishi said that his college study of Sir Albert Howard's (1873-1947) book 'An Agricultural Testament' (1940) had reminded him to

review traditional Japanese technologies in an effort to derive more sustainable agriculture for the Amazon. The project gained aid from the Brazilian National Fund for the Environment (***Fundo Nacional de Meio Ambiente***). Then Ginji Sugiura (1925-) and two other experts from Japan were invited to conduct a training course for Brazilian farmers about the agricultural use of charcoal and its by-products, from September 14 to 21, 1996. The municipality office, under Mario Ishiguro (1953- , vice mayor March 1993-July 1994; mayor July 1994-December 1996) supported these initiatives. Ishiguro is the son of Kumekichi Ishiguro (1916-), a *Kōtakusei*, and founding president (term: a total of 12 years during 1956-96) of the Integral Cooperative of Agrarian Reform of Monte Alegre (***IRAMA*** [***Cooperativa Integral de Reforma Agrária de Monte Alegre***] = *Monte Alegre Nōgyō Kaihatsu Sōgō Kyōdō Kumiai*). [Agro-Nascente 1993, Kishi 1993, Kishi 1994a, Kishi 1994b, Kishi 1994c, Kishi 1997, Personal observations and communications]

The Amazon Forest Conservation and Reforestation Association and the Amazon Gunma Forest - ***Zona Bragantina***

At Santa Isabel do Pará, a Tokyo University of Agriculture graduate, Masaru Nagasaka (1940-), organized the Amazon Forest Conservation and Reforestation Association (***AFA*** [***Associação Florestal Amazônia***] = *Amazônia Shinrin Hogo*

Shokurin Kyōkai) in 1993. The Japanese branch of this association was founded in Shimizu City, Shizuoka Prefecture. Donations for its work were raised through the university alumuni network. The ***AFA***'s sponsored activities included: 1) a 'one tree for one person' reforestation movement, 2) conservation and study of natural forests, 3) promotion of agroforestry, and 4) educational work camps. It had 100 some associate members by the end of 1996, who had each paid membership fees of ¥ 10,000 (US$ 96 by 1993-96 average) per individual or ¥ 20,000 (US$ 192 ditto) per corporation. For each new membership, two seedlings of mahogany, paricá or teak were planted on ***AFA*** member's farms in the ***Zona Bragantina*** (see Table 4-12). One seedling was assigned a number and the name of an associate owner, while the other seedling was designated a 'permanent' reforestation tree. Nagasaka had been interested in reforestation for a long time, and had visited the old experimental field of the Japanese Plantation Company of Brazil in Castanhal. There some paradise nut (sapucaia) trees still grew. Before establishing the ***AFA***, Nagasaka had surveyed the Japanese-Brazilian farms of Pará. All these farms together covered approximately 200,000 ha. Half of this area was estimated to be idle, including many fertilized old black pepper fields. The corporate-owned

Table 4-12. Tree planting of Japanese-Brazilians in the ***Zona Bragantina*** (1998)

Common Name	Scientific Name	Area (ha)	# Trees	Spacing
<Amazon Forest Conservation and Reforestation Association (*AFA*)>*[1]				
Mahogany	*Swietenia macrophylla*	1.5	1,000	3 m x 5 m
Paricá	*Schizolobium amazonicum*	1.1	700	3 m x 5 m
Teak	*Tectona grandis*	0.8	500	3 m x 5 m
<Amazon Gunma Forest>				
African Mahogany	*Khaya nyasica*	3.8	686	
Mahogany	*Swietenia macrophylla*	20.0	3.546	
Virola Pau Rosa	*Virola* spp.	10.2	1.818	
<Okajima Farm>*[2]				
African Mahogany	*Khaya nyasica*	40.0	5,000	8 m x 10 m
Mahogany	*Swietenia macrophylla*	120.0	15,000	8 m x 10 m
<Shimizu Farm>*[3]				
African Mahogany	*Khaya nyasica*	8.8	1,800	
Bacuri	*Platonia insignis*	1.6	200	
Ipê	*Tabebuia* spp.	0.6	60	
Mahogany	*Swietenia macrophylla*	0.5	55	
Neem	*Azadirachta indica*	3.7	3.000	
Paricá	*Schizolobium amazonicum*	22.0	31.280	
Teak	*Tectona grandis*	6.5	7,740	
<Tsuruta Farm>*[4]				
African Mahogany	*Khaya nyasica*	4.0	2,000	4 m x 5 m
Mahogany	*Swietenia macrophylla*	10.0	5,000	4 m x 5 m
Teak	*Tectona grandis*	40.0	20,000	4 m x 5 m

Source: Eida (1998). All trees were planted in live black pepper plantations.
*[1] 150 ha of land was registered to ***AFA*** for reforestation.
*[2] Hiroshi Okajima (1941-) planted trees at Paragominas.
*[3] Shigeharu Shimizu (1937-) was the vice president of the Northern Brazil Gunma Prefectural Association and a director of ***Motobel***. Trees were planted in Castanhal.
*[4] Ritsuo Tsuruta (1944-) was a owner of 200,000 black pepper vines in Castanhal. He also planted some jacarandá (*Dalbergia* spp.), paricá and andiroba in his pepper farm.

farms of ***Grupo APIL*** (Santa Isabel do Pará), ***Motobel*** (Belém), ***Grupo Y. Yamada*** (Belém), etc. added another approximately 200,000 ha to this total. The availability of this land, promising market conditions, and world concerns about tropical forests caused Nagasaka to step forward.

A similar initiative was started by Masao Okajima (1909-) and his son, Hiroshi Okajima (1941-), in

Castanhal. The Okajima family had immigrated in 1954 as ***colonos*** for Paulo Toshio Ōhashi (1917-) at Santa Isabel do Pará. They later developed one of the largest black pepper farms in northeastern Pará, which was expected to produce 1,000 t of product in 1995 (Governo do Estado do Pará 1995). The Okajimas were the leaders of the Northern Brazil Gunma Prefectural Association (*Hokuhaku Gunma Kenjinkai*; Masao Okajima was the chairman 1984-88, advisor 1988-; Hiroshi Okajima was the chairman 1991-). They undertook the Amazon Gunma Forest (***Parque de Gunma*** = *Amazon Gunma no Mori*) project in 1992.

This was initially intended to be a model agroforestry project, along with a collection of useful arboreal species from the Amazon. Gunma Prefecture had become politically influential in Japan, with the election of prime ministers Takeo Fukuda (1905-95, term 1976-78) and Yasuhiro Nakasone (1918- , term 1982-87). Both of these men were interested in Brazil. Moreover, numerous ***dekassegui*** Japanese-Brazilians were then working within Gunma Prefecture. There, a support group called the Association for Creating Gunma Forest in the Amazon (*Amazon ni Gunma no Mori wo Tsukuru Kai*) was organized in 1996, and donations of ¥ 30,000,000 (US$ 274,776) were raised to purchase 540 ha at Santa Bárbara do Pará (Estrada Mosquiero 15 km).

Registration of this land and a project dedication ceremony were held on October 27, 1996. A mission from the Gunma Prefectural Assembly was invited to attend. Project tree planting methods were adapted from the Okajimas' 1993 field trial at Paragominas. There mahogany had been intercropped with black pepper, and given intensive care. Hiroshi Okajima published his plan of the 'Brazil-Japan Friendship Gunma Forest' (*Nippaku Shinzen Gunma no Mori*), that includes a 140 ha model farm of tropical fruits, medicinal plants and multipurpose tree species. Research and accomodation facilities would be attached to the farm. The remaining 400 ha were designated a natural forest reservation. Influenced by the Okajimas, some resourceful farmers in the ***Zona Bragantina*** also started planting trees in their black pepper fields (see examples in Table 4-12). [Associação Florestal Amazônia 1993, Hokuhaku Gunma Kenjinkai 1996, Nippaku Mainichi Shinbun 1996c and 1996d, Han-Amazônia Nippaku Kyōkai 1996d, Nagasaka 1997, Personal communications]

Community-wide goals of Japanese-Brazilians in the Amazon

The Pan-Amazônia Japanese-Brazilian Association (***Associação Pan-Amazônia Nipo-Brasileira*** = *Han Amazônia Nippaku Kyōkai*) also became active under the direction of its chairman, Jōichi Hayashi (1935- , term February 1993-

February 1997). From April 4 to 10, 1994, this association organized a bus trip to visit the 1,500 ha teak plantation established by ***Cáceres Florestal S.A.***, Cáceres, Mato Grosso in 1972. The tour group included 15 participants from Belém, Acará, Castanhal, Igarapé-Açu, Santa Isabel do Pará, Santo Antônio do Tauá, and Tomé-Açu. Also included were Takushi Satō and Nobuo Ezawa from the ***Eidai do Brasil Madeiras S.A.*** (***EDB***) company. The group brought 37 kg of teak seeds back to Pará. According to the minutes of a meeting afterwards (São Paulo Shimbum 1994), most tour participants, including Wildberto Jōji Kimura from Tomé-Açu, knew little about teak trees before the plantation visit. When Kimura reported to farmers at home that teak was resistant to disease, 5-6 months of drought, and even fire, they thought such talk fanciful.

Tour participants from the Acará-Paes de Carvalho settlement were encouraged by the presence of ***EDB*** foresters. Kōichi Hosogoshi (1941-) stated that Japanese farmers should move ahead and set further examples for rural people, who were already mimicking previous Japanese fruiticulture practices. Fifteen families in the settlement planted teak seedlings in black pepper fields (see Table 4-13), and were rewarded with initial growth greater than that observed at Cáceres (trees attained 9 m in height by May of 1996).

These families visited ***EDB*** to further study reforestation. In contrast, Takushi Satō reported an unsuccessful teak plantation experiment, begun in the mid 1970s, on 10 ha at Icoaraci. Compared to the ***Cáceres Florestal*** plantations, ***EDB*** was not serious enough to properly tend planted trees, given the availability of abundant natural forest timber resources.

Table 4-13. Tree planting examples of Japanese-Brazilians at Acará-Paes de Carvalho Settlement (1999)

Owner	Common Name	Botanical Name	# Trees	Area (ha)	Black Pep. (ha)
Isamu Isobe (1937-)	Andiroba	*Carapa guianensis*	1,500	3.0	
	Ipê-Roxo	*Tabebuia* spp.	2,500	4.5	
	Teak	*Tectona grandis*	9,500	19.0	18.0
Hiroo Egoshi (1941-)	Andiroba	*Carapa guianensis*	1,500	2.0	
	Ipê-Roxo	*Tabebuia* spp.	2,500	4.0	
	Teak	*Tectona grandis*	2,500	4.0	7.0
Kōsei Egoshi (1934-)	Teak	*Tectona grandis*	600	2.0	1.5
Kōichi Hosogoshi (1941-)	Teak	*Tectona grandis*	500	2.0	5.0
Kenji Hosogoshi (1948-)	Teak	*Tectona grandis*	500	2.0	3.0
Yukio Ichijō (1948-)	Teak	*Tectona grandis*	700	2.0	15.0
Motonori Yamamoto (1950-)	Teak	*Tectona grandis*	500	2.0	5.0

Source: Tsutsumi (1999). Teak trees were planted in black pepper fields (only live plantation areas are listed). Teak of early 1995 attained 12-13 m in height, and 22 cm in DBH.

The Pan-Amazônia Japanese-Brazilian Association organized a second study tour on June 26, 1996 to Paragominas, where the plywood company ***Floraplac*** had created a 500 ha paricá, 350,000 seedling plantation in 1995. The Okajima Farm was also visited to see mahogany that had been planted there in a black pepper field in 1993. About 150 Japanese-Brasilian farmers and businessmen from Tomé-Açu,

Zona Bragantina and Belém participated. The group included a JICA representative and the Japanese consul from Belém. Forty-two people from Tomé-Açu took part in this tour. Tomio Sasahara (1939-) of Daini Tomé-Açu was impressed by the rapid growth of well fertilized monoculture plantations, but showed this author wood-boring beetles already damaging both the paricá and mahogany species. After the tour, Jōichi Hayashi presided at a series of reforestation meetings in Belém, beginning on July 9, 1996. He also visited Japan that year, seeking support from government agencies.

Through his articles in the monthly journal Pan-Amazônia, Hayashi encouraged farmers to plant trees in the manner of their 'traditional agroforestry,' i.e., mixed-planting of trees among current farm crops. He pointed out that monocultures should be avoided, based on the common sense gained from past experience. Mutual cooperation was urged to resolve problems of species selection, pests, and diseases. Hayashi asserted that reforestation would be the last chance for issei to overcome their generation's agricultural difficulties, thereby leaving a beneficial heritage (including cultural values) to their descendants. Otherwise, the path of least resistance for ***dekassegui***, during their last stages of life, would be to reduce family

farms that had been created by decades of immigrant sweat, to mere wastelands.

Interested farmers have gained a realistic vision of the economic potential of tree planting through recent events: e.g., the JICA forestry cooperation project with ***INPA*** that started in July of 1995; the Japanese Ministry of Trade and Industry (MITI) announcement of the creation of the General Overseas Reforestation Center (*Kaigai Shokurin Sōgō Center*) in June of 1996; and the arrival of Malaysian sawmills in the Amazon in July of 1996, having exhausted timber supplies in Southeast Asia. By the end of 1996, at Tomé-Açu alone farmers had purchased seeds from Cáceres for 100,000 teak seedlings, while procuring seeds from within the settlement to grow another 60,000 paricá seedlings. [Tsutsumi 1994, São Paulo Shimbun 1994 and 1996, Han-Amazônia Nippaku Kyōkai 1996a, 1996b, and 1996c, Hayashi 1996a and 1996b, O Liberal 1996a and 1996b, Nippaku Mainichi Shinbun 1996b, Agro-Nascente 1996b, Personal observations and communications]

Summary

Japan has been historically divided, both geographically and politically, by steep mountains. This delimited the arable ground available to farmers for

agriculture. Besides, yields of rice (staple food crop) were highly sensitive to labor inputs, so that Japanese agricultural technologies were developed based on labor intensification. Since the 16th century, increasing population and civil wars caused the depletion of Japan's natural resources. Local *samurai* leaders were forced to start paying attention to sustainable forest management, and agricultural improvements on an eroding land base. Such initiatives influenced farmers over time. Master farmers called '*rōnō*' contributed to agricultural development during Edo and Meiji Periods. Their legacy was succeeded by innovative farmers called '*tokunō*' even after the establishment of modern agricultural research and extension systems. The chief objective of Farmer Training Centers, including emigration schools, was to produce such '*tokunō*' farmers. The 'tokuno' immigrants have contributed to Brazilian agriculture, and they are still making innovations there (see Chapter 2, and Nippaku Mainichi Shinbun 1996a).

Japanese immigrants arriving in the Amazon by the late 1920s also included a number of '*tokunō*' spirits, equipped with the skills and habits of small-scale, intensive agriculture. They also had experience in mixed-planting, some types of agroforestry, and reforestation. However, endemic tropical diseases humbled them, killing many.

Desperate immigrant farmers slashed forests to produce rice and vegetables, with the thought of abandoning fields as soon as possible. A small number of leaders pursued 'permanent crops' as a goal, from which black pepper culture emerged. At the outset, farmers applied the intensive clean culture system they were familiar with from home, planting 1,000-3,000 black pepper plants (1-3 ha) per family. However, market collapse and disease outbreaks in the 1950s and 1960s forced farmers to expand their operations or diversify their farms, to sustain their standard of living.

Potential crop alternatives to black pepper were collected and tested in homegardens. The ***CAMTA*** cooperative supplemented individual efforts with its own experimental plots and nurseries. In addition, ***JAMIC*** established research and extension facilities at Daini Tomé-Açu. Through trial and error, Japanese farmers encountered various types of agroforestry practices in the wake of the black pepper boom. In particular, the widespread reintroduction of cacao accompanied by shade trees awakened their inventive minds. In the early 1970s, immigrant farmers began substituting cupuaçu for cacao, and timber trees for shade trees. Creative inspiration also came from rural Brazilian homegardens, and trees planted by the Japanese Plantation Company of Brazil during the 1930s.

While some *nisei* and *sansei* were attracted by the lifestyle of Brazilian ranchers, growing global environmental concerns in the 1980s encouraged agroforestry practices. JICA subsidized a juice factory to revive tropical fruit culture at Tomé-Açu.

In the 1990s, timber extraction and pasture development issues became even more volatile in the Amazon. Group initiatives to undertake reforestation and forest conservation appeared at Tomé-Açu after the Earth Summit of 1992, and spread from there to other Japanese settlements in Pará. Pioneering farmers, like Masao Nagaoka in Manaus and Noboru Sakaguchi at Tomé-Açu, identified farm biomass as the index of sustainability, and encouraged reforestation through agroforestry practices. The merits and difficulties associated with such production systems are evaluated for current representative Tomé-Açu cropping systems in the next chapter.

CHAPTER 5
THE JAPANESE-BRAZILIAN AGRICULTURE AT TOMÉ-AÇU: CURRENT STATE AND PROSPECTS FOR THE FUTURE

Introduction

This chapter discusses the state of the Japanese-Brazilian settlement at Tomé-Açu and its agricultural activities in 1995-96. The key objective of this chapter is to examine the economic viability of intensive cropping and agroforestry systems at Tomé-Açu, as alternatives to extensive ranching. Maps of the settlement, districts and individual farms are listed in Figures 5-1 through 5-4. These maps are based on the October 1989 lot map for electrification and rural telephone system development (COERTA 1989). Circled landowner names outside the lotted area are mostly those of ranchers, who own large land areas (hundreds to more than a thousand hectares) in the newly opened forest.

The first part of this chapter describes demographic features of Japanese-Brazilians at Tomé-Açu. Readers may compare these results with the earlier study of Staniford (1973), who surveyed Tomé-Açu during 1964-65. The next two sections examine the farm size and land use of Japanese-

Figure 5-1. Tomé-Açu Japanese-Brazilian settlement in 1996 (modified from COERTA 1989)

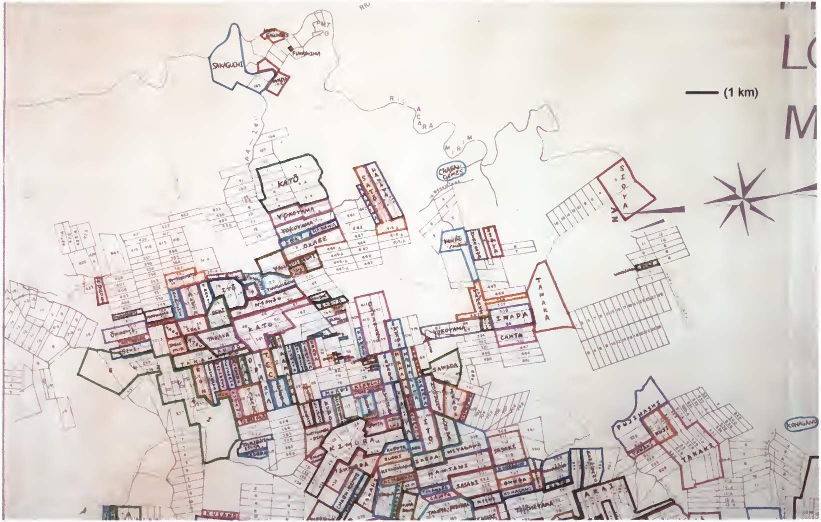


Figure 5-2. Central Tomé-Açu in 1996 (modified from COERTA 1989)

Figure 5-3. Breu districts in 1996 (modified from COERTA 1989)

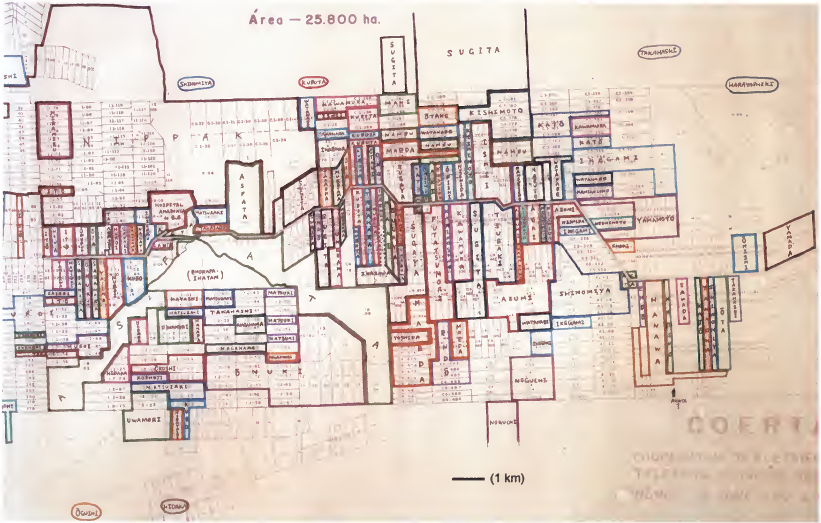


Figure 5-4. Daini Tomé-Açu in 1996 (modified from COERTA 1989)

Brazilians, and crops/cropping systems at Tomé-Açu Settlement. This author conducted one-year financial record keeping of representative cropping systems (29 cases) at Tomé-Açu during 1995-96. The results are presented with analysis. Finally, projections regarding the future of this community and its land use practices are provided, together with their implications for sustainable development of the Amazon.

Demographic Features of Today's Settlement

According to Tomé-Açu Nōson Shinkō Kyōkai Shokurin Iinkai = ***ASFATA*** Reforestation Committee (1998), out of 45,066 (23,722 male, 21,344 female) registered residents of the municipality in 1996, the Japanese-Brazilian population constituted 3.4%, or 1,542 people. That year, this author counted 1,570 Japanese-Brazilians at Tomé-Açu based on land or residence holding, of which 917 individuals were actually resident. Another 275 people were living outside the municipality in Brazil, 372 were in Japan, 3 were in the US, and 2 children were in the Philippines.

Figure 5-5 shows the population distribution of Japanese community at Tomé-Açu by age and sex, at the end of 1996. A striking situation may be noticed: most people from the late teens up to the early 30s are absent. The two

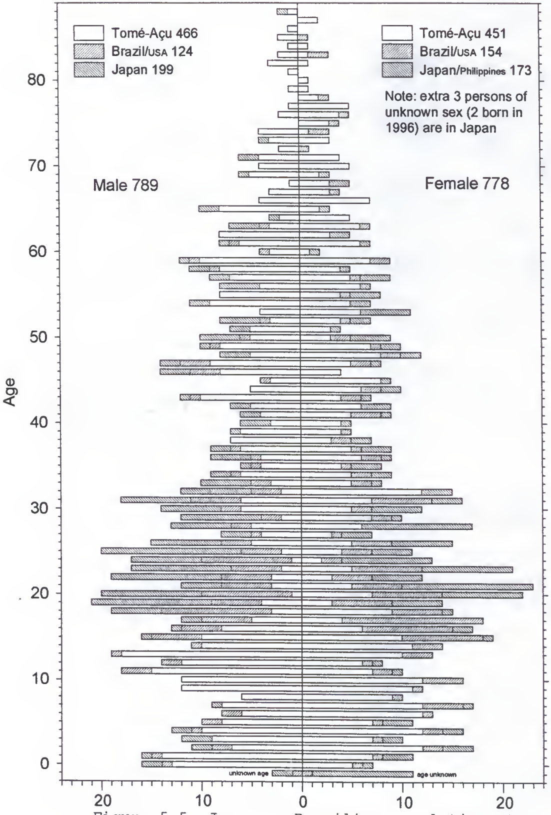


Figure 5-5. Japanese-Brazilian population at Tomé-Açu (Dec. 1996)

major reasons for this are education and ***dekassegui*** (*dekasegi*) to Japan. The students from Tomé-Açu must leave if they are to pursue post-secondary education opportunities. To be able to enter a good post-secondary institution, they even need to attend urban private secondary schools, living apart from their families. In Figure 5-6b, most students in Belém, southern states (Minas Gerais, Paraná and São Paulo), and the US are studying in secondary schools and colleges. Hence, parents must provide them with secure accommodation in the cities and pay expensive school fees. The protracted depression in Brazilian agriculture and hyper inflation in 1980s made this a challenging task. Thus, childrens' education, in addition to farm finance, became a major reason for the housewives and elders to opt for ***dekassegui*** in Japan (see Chapter 3, Mori 1993). Their overseas remittances supported family chiefs running farms, and children studying in the cities.

Repeated strikes by college professors in Brazil up until 1994 also postponed graduation. With an uncertain future for obtaining advanced degrees, and high costs of living in Brazil's cities, many Japanese-Brazilian students from rural settlements dropped out to join ***dekassegui*** corps. Working in Japan became a rite of passage for youths who had completed secondary school (see Figure 5-5). The hyper

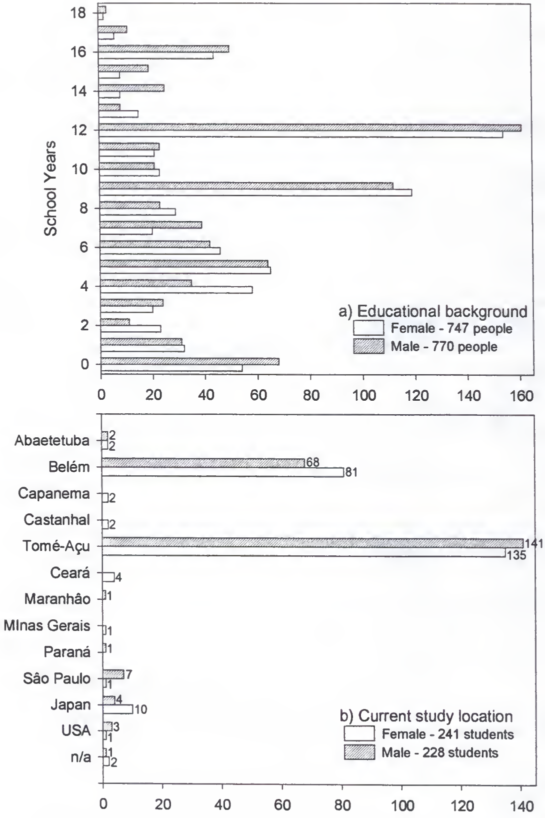


Figure 5-6. Japanese-Brazilian education at Tomé-Açu

inflation finally ceased in July 1994, when the new currency Real was institutionalized. However, farming remained difficult by the overvalued Real (prejudicial to export crops), limited agricultural finance, escalating official interest rates (45%/year by the end of 1998), and stagnant product markets. Thus, ***dekassegui*** continued. The university graduates who could not find good employment, and even among those who had distinguished jobs such as bank managers or physicians, went to Japan for menial jobs with high short-term returns.

Under such circumstances, it was unclear how many of those urban-educated and/or ***dekassegui***-oriented youngsters would eventually come back to Tomé-Açu. The entire population of Japanese-Brazilians at the settlement had decreased by one third over three decades (Figure 5-7b). The major cause of population decrease was the *Fusarium* outbreak in the 1970s (see Chapter 3). However, another type of population outflow was occuring: some old farmers were moving out to live with children established in the cities (see Figure 5-8; off-farm employment outside Tomé-Açu). In addition, ***dekasseguis*** who went to Japan as whole families may not return for an extended period. These two groups constituted a major portion of absentee landowners

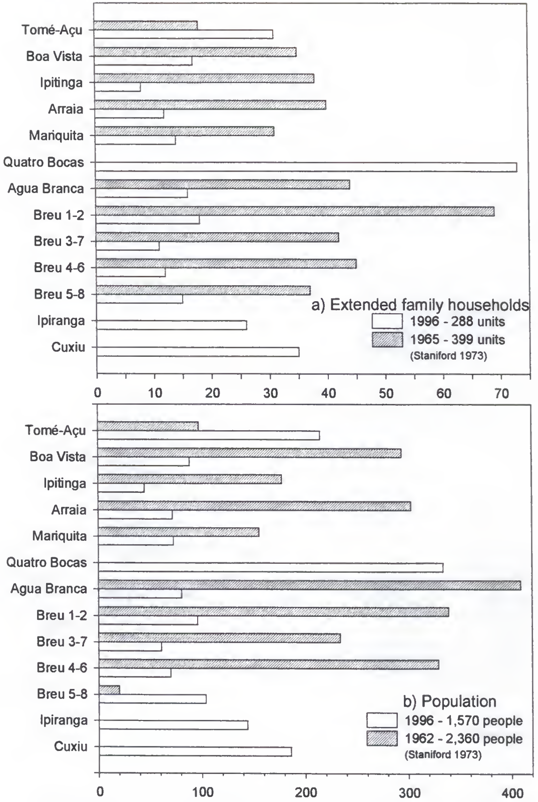


Figure 5-7. Japanese-Brazilian population change at Tomé-Açu by districts

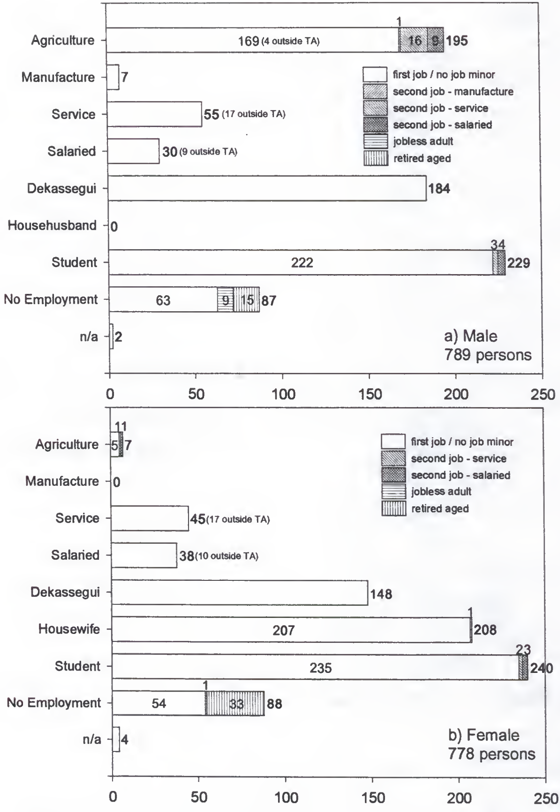


Figure 5-8. Japanese-Brazilian occupations at Tomé-Açu

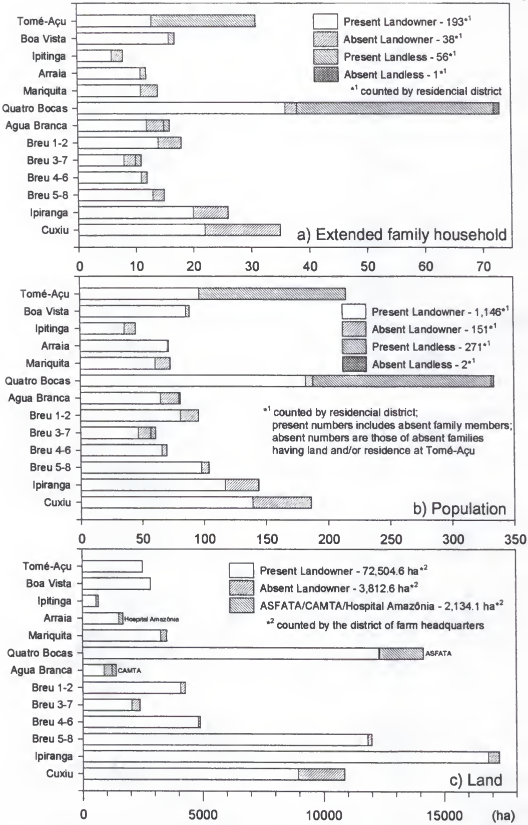


Figure 5-9. Japanese-Brazilian land holding by districts at Tomé-Açu

relying on local farm caretakers, either relatives or friends (Figure 5-9).

Meanwhile, movement to the urban centers within the settlement to the towns of Quatro Bocas (***Cidade Quatro Bocas***) and Tomé-Açu (***Cidade Tomé-Açu***) was also observed (Figures 5-7 and 5-9). This doesn't necessarily indicate farm abandonment (see Figure 5-9c). Most of the landless population was also concentrated in the urban districts (Figure 5-9 and Appendix C). Living in town, a farm owner and his/her spouse could enjoy off-farm employment (Figure 5-8), better security against night bandit assaults, and schools for the children. They could commute to farms before/after hours and weekends. This seemed to be the option that many people would choose if they were able. Some parents had purchased urban land-lots at Quatro Bocas for their children's future housing. A popular dream expressed by home-coming youngsters, either on school vacation or on ***dekassegui*** leave, was to open an independent business in town, while managing a farm (***sítio***) handed down from their parents. If successful, they would also have a ranch (***fazenda***) outside the settlement.

Three families of Breu 5-8 (Canindé) district, namely T. Nagai, Harayashiki, and Shinomiya, realized such a dream. Their common features are:

1) post-World War II immigrants who created productive fields of black pepper and tropical fruits

2) former large producers of ***CAMTA*** who seceded after the incident of 1983 (see Chapter 3)

3) good cooperation among siblings by pooling capital for common goals

4) at least one sibling of each family has been to Japan for job training or ***dekassegui***

5) have specialization among family members (e.g., farm, agricultural processing, ranch, mechanics, horticulture, trade, etc.)

6) own sizable farm product processing facilities for black pepper and tropical fruits

7) own ranch (Nagai 1,520 ha, Harayashiki 780 ha, and Shinomiya 230 ha of pasture in 1996)

8) have a business office at Quatro Bocas (Nagai opened a supermarket in Belém in 1995)

9) deal with farm products of their own and of other producers

10) offer miscellaneous services such as retail of farm materials and car parts, foreign exchange, airplane booking, boutique, etc.

In these cases, however, they were still based on farms at Canindé where various crops were cultivated. Family member(s) commuted to business offices at Quatro Bocas weekdays.

Takashi Nambu (1946-), the managing director of ***CAMTA*** (term 1993-97) explained about such life/work style (Nambu 1995a). He had been asked by prominent local Brazilians (i.e., ranchers, merchants, and saw mill owners) why

Japanese-Brazilians (***japonèses***) prefer to live in the bush (***roça***) instead of in town (***cidade***). He answered that intensive farm management would be difficult without the owner inspecting crops every day. Nambu was living alone at Cuxiu district, while his wife was gone ***dekassegui***, and son and daughter were studying in the US (theology) and Belém (medicine), respectively. Nambu commuted weekdays from his farm to ***CAMTA*** 90 km round trip on a dirt road.

The Japanese-Brazilian farmers living at Quatro Bocas accumulated more pasture than any other district, if ***Fazenda Nippaki*** (the company president is in Japan) of Ipiranga District is excluded (see Appendix C). Also, the ratio of pasture to the area of all other crops was highest at Quatro Bocas. Pasture requires less intensive care, and could be managed by a few cowboys (***vaqueiros***) living on site. Most Brazilian ranchers live in town, and occasionally visit their ranches. Seemingly, even inside the settlement, urbanized Japanese-Brazilians are adopting a more extensive farming style.

Nevertheless, the future of agriculture at Tomé-Açu depends on how many Japanese-Brazilian youngsters will eventually return to the settlement from education elsewhere and ***dekassegui*** in Japan (see Figure 5-10). This is a primary concern of all, either ***issei*** or ***nissei***, cooperative

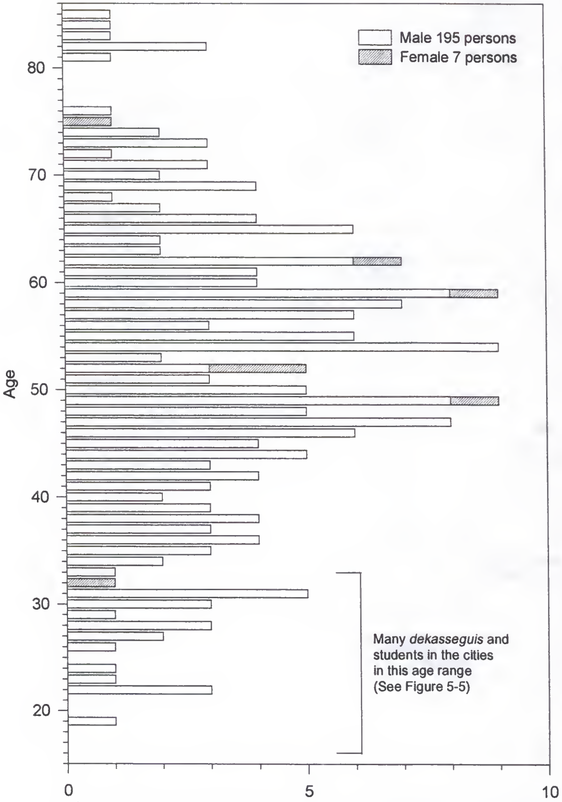


Figure 5-10. Age distribution of Japanese-Brazilian farmers at Tomé-Açu

members or non-associates. A sticker and a poster were distributed from two sources (Appendix D), while this author was conducting field research there. The successful ***nissei*** farming-middlemen Tetsushi Nagai (1952-) and Haruki Nagai (1962-) made a windshield sticker "I love Tomé-Açu" (Figure D-1). The last ***issei*** management of ***CAMTA*** published a Buddhist-looking poster (Figure D-2), that reads "There lies the Great River, the land of our fruit, the land of our delight (in Japanese) - ***CAMTA*** together with Nature, producing the best fruits (in Portuguese)." Here, people of different generations and interests shared a vision for perpetuating their settlement - the land of tropical orchards. The first prize of All Brazil Haiku Competition (*Zenpaku Haiku Taikai*) of 1996 was awarded to Taeko Mineshita (1935-96) of Tomé-Açu, for her "*Tsugiki-shite Kora-no Furusato Yutakanisu.*" It means "we *issei* immigrants graft fruit trees (as well our culture and values) to enrich the homeland of our *nisei* successors."

To this end, however, the real challenge is in product marketing, and most urgently, improvement of the road system for delivering products to market (see Hechet and Cockburn 1989). In the rainy season, less than 200 km of travel between Tomé-Açu and Belém takes eight hours. The bumpy dirt road wears down the vehicles, damages perishables, and

exhausts passengers. In the dry season, the choking clouds of road dust often cause fatal accidents. If the road were surfaced (it has been surfaced on the map since late 1970s), the travel could be reduced to only two and half hours, and product options would be much increased, including fresh fruits and vegetables. The leaders of Tomé-Açu municipality negotiated over the last 20 years with the state for road improvements, but there has been little actual progress to date. To make the best of these conditions, ***CAMTA*** and resourceful individual farmers appointed agents in Belém and other large cities. The farm production was focused on 'traditional' dry matter such as black pepper and cacao, and frozen fruit pulp (cupuaçu, soursop, acerola, açai, etc.) to get around the road problem. With such limited products, however, farmers remain vulnerable to market fluctuations. This tends to dissuade younger people from going into farming and taking over the work of their elders.

Farm Size and Land Use

At the end of 1996, there were 233 Japanese-Brazilian farm units (including 8 organizational properties) at Tomé-Açu. Their sizes varied from a vegetable field of less than one hectare to a ranch of thousands of hectares (Appendix C). Some farms are owned and managed by complex families

(siblings and their dependents), or by companies of friends or relatives (such as in-laws). By the 1960s, 20-25 ha (1 lot) was the standard farm unit for a family to become independent. However, social stratum differentiation within three decades was rapid. While many of the pre-war immigrant patrons (see Chapter 3) declined after the black pepper boom, enterprising post-war immigrants enlarged their properties, accumulating lots left by those who moved away, or by purchasing lands outside the settlement. The landless population (see Figure 5-9) concentrated in the towns (***Cidade Quatro Bocas*** and ***Cidade Tomé-Açu***) includes two polarities: successful families with off-farm businesses, and the impoverished people merely surviving with daily employment. They either sold out their original lots, or did not inherit any from parents.

The recent land accumulation process of Japanese-Brazilian farmers are apparently related to their adoption of cattle ranching (***pecuária***). Up to the 1960s, only a few Japanese planted grass in a extra lot to raise a small herd (e.g., 20-30 cows) for local milk and beef supply (e.g., Itō Farm from Hokkaidō settled at Ipitinga District, and Katō Farm, the black pepper pioneer, at Boa Vista District). Brazilian ranchers (***fazendeiros***) had limited their operations to areas along rivers good for animal transpor-

tation to urban markets. Since the 1970s, however, the forest surrounding the settlement was rapidly fenced by the southern Brazilians from Minas Gerais (called ***mineiros***), Espirito Santo (***capixabas***), etc. These ranchers came along the new state roads (see Chapter 3), entered the forest outside the settlement, and opened border paths (***picadas***) to claim their properties. Locals then living in the forest without land titles (called ***moradores***) were said to be relocated with meager compensation, or merely by threats from the rancher bodyguards (***pistoleiros***) (see Page 1995). The settlement of Tomé-Açu was becoming an enclave. At this point, some Japanese-Brazilian farmers decided to enter the cattle raising sector (e.g., Satō Farm at Boa Vista District, Takahashi Farm at Ipiranga District, and *Sekisei Kai* farmers at Cuxiu District). The black pepper failure in 1973-74 (see Chapter 3) further motivated them to enter ranching, but frustrated them because of the shortage of capital for ranch investment (Daini Tomé-Açu Jichikai 1984).

In 1975, the San Stepano Farm (325 ha) of the Elizabeth Saunders Home at Ipiranga District (see Chapter 3) was purchased by the Japan-Brazil Agriculture and Cattle Raising Company (***Nippaki Agro Pecuária Ltda.*** = *Nippaku Nōbokuchiku Yūgen Gaisha*). It was founded by an assemblyman of Gifu Prefecture in Japan, Takeo Sugimoto (1920-), and employed

some Japanese immigrants locally. Starting from 1976, the ranch ***Fazenda Nippaki*** opened a large pasture at Daini Tomé-Açu (Figures 5-1, 5-4, and 5-11). It aroused the interest of Japanese-Brazilian farmers venturing into extensive cattle raising, and eager to learn more this still-unfamiliar practice. By the 1980s, the Southern Brazilian ranchers began absorbing settlement lots given up by Japanese-Brazilians or other Brazilian farmers. The watershed protection forests within the settlement reserved by the former Japanese Plantation Company of Brazil were encroached upon by local merchants and sawmill owners (from south and northeastern Brazil) for pasture creation. The lands had not been lotted or titled to individual farmers (see blank portion of Figures 5-2 and 5-3), and the concession was seized during World War II (see Chapter 3). Hence, wealthy people only had to remove ***moradores*** along the streams (***igarapés***) to establish their land claims. Meanwhile, pasture creation by Japanese-Brazilians was stagnant due to fluctuation of the agricultural product market. Since the late 1980s, however, the external capital input from ***dekassegui*** accelerated their move forward (Figure 5-11).

During 1995-96, this author noticed that size of land holdings was being viewed in 'ranch' terms rather than in

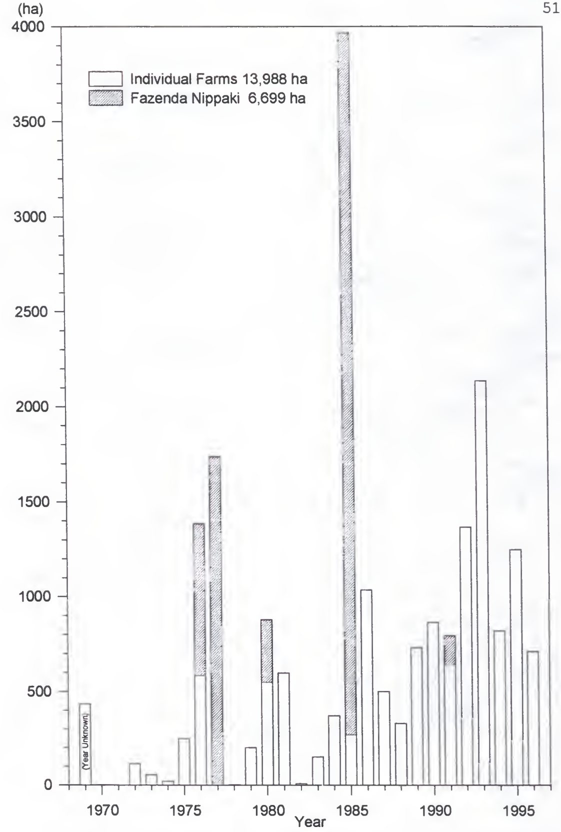


Figure 5-11. Japanese-Brazilian pasture creation at Tomé-Açu

terms of the land area of the intensively cultivated farms (of the original Japanese settlement). For example, ***Banco da Amazônia S.A.*** (***BASA***) informed ***CAMTA*** associates that farms of less than 200 ha were eligible for its 'small farmers' loan program. This is equivalent to 8-10 lots, a fair dimension for black pepper and fruit culture, while being tiny as a ranch. This author found that this limit coincided with the range of Japanese-Brazilian farms holding no cattle, with only a few exceptions (Figure 5-12). On the other hand, all recognized ranchers in the Japanese-Brazilian community owned more than 700 ha. This may seem small compared to the established local Brazilian counterparts; however, most Japanese-Brazilian ranchers maintained an intensive cropping sector as well (Appendix C). Thereby, this author tentatively categorized the Japanese-Brazilian farms into three classes 1) Small Farms or Crop Farmer Class with < 200 ha of land, 2) Medium Farms or Transitory Class with ≥ 200 ha but < 700 ha, and 3) Large Farms or Rancher Class with ≥ 700 ha (see Figure 5-12).

Figure 5-13 shows the Japanese-Brazilian farms with agroforestry components. These are farms having tree crops for fruits, latex, and timber. In fact, the large ranchers, such as T. Nagai Farm at Breu 5-8 District and Takahashi Farm at Ipiranga District, were also leading in crop farming

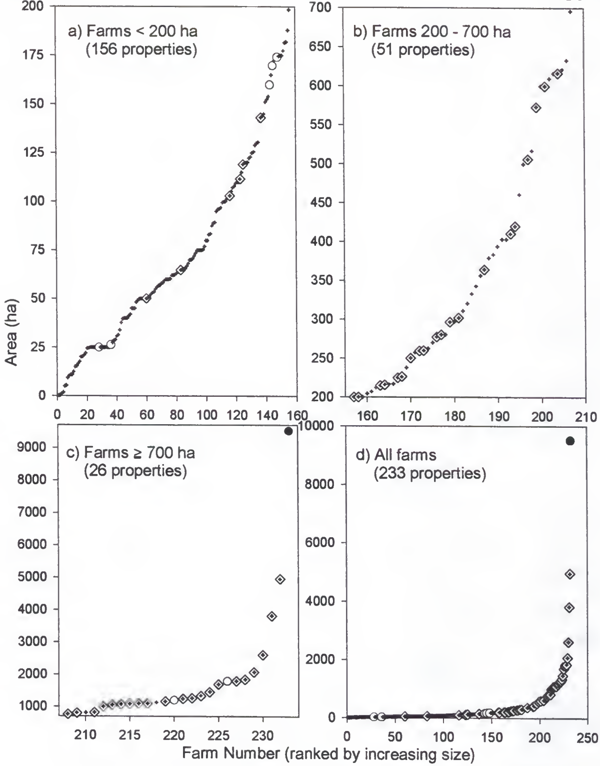


Figure 5-12. Japanese-Brazilian farm size at Tomé-Açu

- Individual without cattle
- Individual with cattle
- Organization without cattle
- Organization with cattle

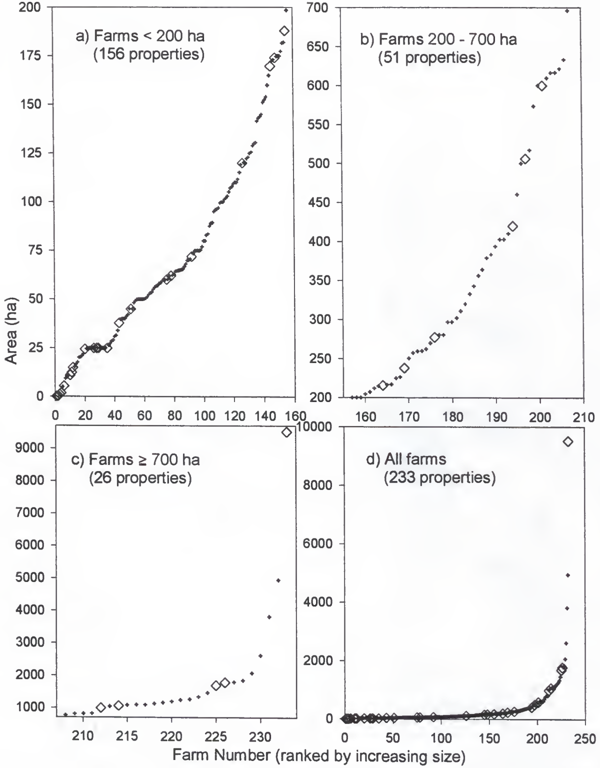


Figure 5-13. Japanese-Brazilian agroforestry farms at Tomé-Açu

and agroforestry. Michinori Konagano (1958-) at Breu 3-7 District said he had learned that ranching is a reliable 'savings account' (***poupança***) in the Brazilian national politics (Konagano 1995). Konagano Farm is one of the most profitable among Japanese-Brazilians with diverse perennial and tree crops. The owners, four brothers, recently purchased a 20-year old ranch (375 ha) with their farm income and ***dekassegui*** remittance. Takaaki Harayashiki (1948-99), the trader of Harayashiki Farm, said cattle were advantageous for producers because they would not go bad in the field like tropical fruits. This is an important point when one considers that commercial settlements always delayed for 10-20 days under the Real Plan money shortage (Harayashiki 1995). Jorge Itō (1955-), the current president of ***CAMTA*** (term 1997-), said there was a limit for most Japanese-Brazilians to expand black pepper and fruit culture due to restricted family labor distribution and laborer availability at the busy farming seasons (Itō 1995). Hence, Itō concluded, ranching might be the best option for further expansion of individual farms, although this would provide little benefit to the cooperative (***CAMTA*** doesn't trade cattle). All these people, however, considered ranching one element of a diversified farming system, and

noted besides, that relying solely on cattle would involve problems with cash flow.

As shown in Figure 5-14, the total land owned by Japanese-Brazilian farmers at Tomé-Açu was 78,450 ha, of which 48,567 ha (61.9%) belonged to 26 large farms, 18,444 ha (23.5%) to 51 medium farms, and 11,440 ha (14.6%) to 156 small farms. Individual holding and land use data are available in Appendix C. Concerning pasture, 17,301 ha (83.6%) was dominated by large farms, while 3,043 ha (14.7%) belonged to medium farms, and 343 ha (1.7%) to small farms (Figure 5-14). This reveals that a small portion of Japanese-Brazilian farms at Tomé-Açu (11.2%) were establishing sizable ranches, while most others remained dependent on crop farming. Figure 5-15 shows the ratio of land use in each farm class. The portion of commercially extracted forest and pasture increase along with farm size. However, the increase in portion of pasture with increasing farm size is even more dramatic. In the largest farm group, the portion in pasture approaches that in commercially extracted forest. Another conspicuous feature is a decrease in the portion of secondary forest decreasing as farm size increases. The proportion of secondary forest is roughly double that of the cropped (excluding pasture) land in each class.

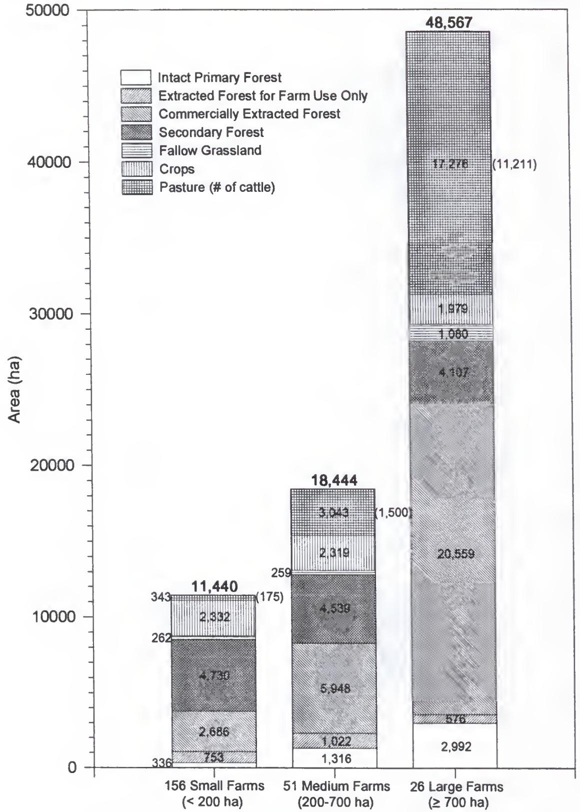


Figure 5-14. Japanese-Brazilian land use by farm size at Tomé-Açu #1

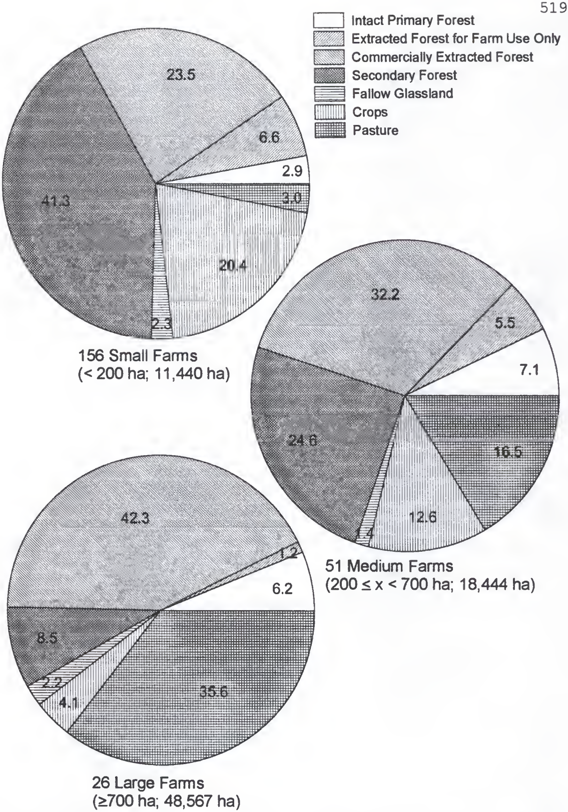


Figure 5-15. Japanese-Brazilian land use by farm size at Tomé-Açu #2

The origin of secondary forests in the settlement is related to former swidden cropping of rice, cassava, and grass for black pepper mulching (see Table 4-3 of Chapter 4). Farmers continuously cultivated good land within the limits of individual farm management, while land with stony soil (***'piçarra'*** = ***solo concrecionário laterítico***) in the soil category of ***Latosol Concrecionário Alaranjado*** (Falesi et al. 1964, Falesi 1972) were abandoned soon. The ***'piçarra'*** is sporadically distributed all over the settlement, and used for road construction. However, this author could not find the specific reasons for the 1:2 ratio between cropped land and fallowed secondary forest. Furthermore, the ratio of fallow grassland (***capinzal***) to cropped land is highest in the large farm class. One possible reason could be the occurrence of large scale perennial cropping, mostly of black pepper, in remote fields (see Chapter 4). While some vines are still alive and stakes are not yet removed, the fields appear to be abandoned. After the owner moves stakes to a new black pepper field, the fallow grassland may be planted with crops manageable from a distance such as oil palm, or more likely pasture grass. Figure 5-16 shows more clearly the correlations stated above. The 1:2 ratio of cropped land to secondary forest in all farm classes is apparent. Lands in

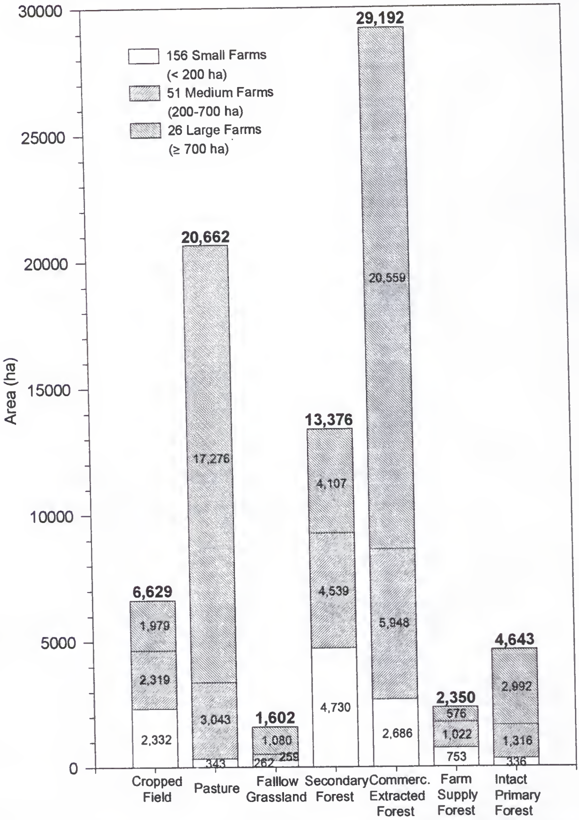


Figure 5-16. Japanese-Brazilian land use by farm size at Tomé-Açu #3

most of these land use categories are situated near farm headquarters, or within the settlement, while primary (intact or extracted) forests and pastures are generally farther away in newly acquired areas.

The adoption of ranching has altered the land use patterns of Japanese Brazilians, most significantly in relation to large farms. In the properties located at the edge of the settlement, commercially extracted forest and pasture dominate (Figure 5-15). According to Mattos and Uhl (1994), timber extraction in the Amazon has been subsidizing pasture creation, and pasture recuperation more recently. The authors stated that ranchers in neighboring Paragominas were selling timber extraction rights to local sawmills for US$ 70/ha, while potential self-harvest profit was estimated US$ 200/ha. During this author's stay at Tomé-Açu, the price of extraction rights was R$ 30-40/ha (US$ 33-44/ha) in 1995 (Ōnuki 1995a), and R$ 60/ha (US$ 60/ha) in 1996 (Sugimoto, N. 1996). There were also more complicated negotiations. For example, a lumberjack at Quatro Bocas offered stumpage of R$ 10 (US$ 10) per 'white wood' tree, and R$ 15 (US$ 15) per 'red wood' to ***Fazenda Nippaki***, with an estimate of 12-20 tree harvest per hectare (Sugimoto, N. 1996). If it is really the case, the ranch could gain R$ 120-300/ha (US$ 120-300/ha) from timber extraction. In

contrast with such timber extraction subsidies, the average net income of non-specialized ranches (i.e., having self-producing herd and usually selling oxen and old cows for meat) at Paragominas was only US$ 6/ha/year for medium sized (500-3,600 ha) ranches, and US$ 20/ha/year for large (> 6,000 ha) ranches (Mattos and Uhl 1994). In this author's field survey for September 1995 to August 1996, the magnitude of owner self wages plus profits (including cattle weight increase/decrease in the field) of three ranches (Takahashi 1,172 ha, Harayashiki 780 ha, and Ōnuki 400 ha) was R$ 29±1/ha/year (R$ 1 ≒ US$ 1; refer to Table 5-2).

The cost of establishing a new pasture at Harayashiki Farm in this author's research was R$ 180/ha for a total of 96.2 ha, excluding infrastructure (estimated at US$ 15/ha by Mattos and Uhl 1994) and the rent of an already depreciated bulldozer (US$ 97/ha using the figure given in Mattos and Uhl 1994). Hence, without fertilizer application, it might cost more than R$ 290/ha to create a new pasture. The pasture depreciation period commonly used by the Japanese-Brazilian ranchers of Tomé-Açu was 10 years. At Paragominas, the average cost for pasture recuperation, including fertilizer application, was reported to be US$ 260/ha by Mattos and Uhl (1994).

The above figures show the significance of the extracted timber subsidy, which would nonetheless, by

itself, usually be insufficient to finance quick pasture expansion. Hence, the growth of Japanese-Brazilian ranches within the past decade (excluding ***Fazenda Nippaki***; see Figure 5-11) must have required capital transferred from other sectors, i.e., crop farming, farm product trading, or ***dekassegui***. Although this author did not attempt to quantitatively measure the contribution from each source, various ranch owners told this author that they struggled to generate funds for pasture expansion.

Another puzzle of timber extraction concerns a ratio that varies by farm size: the area of pasture in relation to that of commercially extracted forest was 85% for large farms, 50% for medium farms and 10% for small farms (calculated from Figure 5-16). This leads one to wonder why the smaller farms had a relatively large area of commercially extracted forest rather than reserving the timber for their own future needs. Commercial timber extraction at small farms seemed disproportionately large for the needs to finance pasture creation. On the other hand, 2,686 ha of extraction would provide an average of only R$ 500-1,000 for each of the 156 small farms. It seems they would have preferred to keep a third of their lands (Figure 5-15) as wood reserve for their own future needs,

e.g., stakes for black pepper and passion-fruit, house and shed construction.

However, the situation changed after sawmills and lumberjacks arrived at the settlement (Maki 1995, Ōnuki 1995c, Takahashi 1996). Ignoring lot borders, the strangers extracted timber without compensation to the owners. Some hired ***moradores*** to disguise themselves as landless farmers (***sem-terras***) claiming idle land, and had them invade properties with valuable timber. Their 'employers' provided them with food, rifles and chainsaws. After a year and a day of occupation to establish legal land claims and cut all valuable trees, they sold the land to a third party (most likely ranchers) and moved on to another target. A land owner who would dare to confront such intruders must be resourceful and well armed. A Japanese-Brazilian farmer who tried to negotiate with such invaders was shot and injured. Kunimitsu Ōnishi (1933-) said primary forest had become no longer a valuable resource for a small farmer, but more a seed of anxiety (Ōnishi 1995). Hence, if someone should politely come to ask for timber extraction, the owner should happily agree to it for nothing - at least the land would be safe once the timber was gone.

Climate and Cropping

Tomé-Acu is located on 2°31' S and 48°22' WGr, with an altitude of 53 m above mean sea level (Albuquerque and Duarte 1991). These coordinates refer precisely to ***CPATU-INATAM*** of Ipiranga District, Daini Tomé-Açu. The local climate belongs to Ami of the Köppen classification. The climatic indices including precipitation, relative humidity, temperature and clear sky duration are shown in Figure 5-17, based on data from ***CPATU-INATAM*** (1978-90) at Ipiranga and ***CEPLAC*** (1990-96) at Quatro Bocas. The ***CPATU-INATAM*** recorded the mean annual precipitation as 2,663 mm, the mean annual relative humidity as 80%, the mean minimum annual temperature as 21.8 °C, the mean maximum annual temperature as 32.9 °C, the mean annual temperature as 26.4 °C, and the mean annual clear sky duration as 2,354 hours. ***CEPLAC*** recorded the mean annual precipitation as 1,982 mm. Old people at Tomé-Açu claimed there have been less precipitation and higher temperatures in recent years. Many attribute this perceived climatic change to preceding natural forest destruction. ***CEPLAC*** observations do show less precipitation in recent years. Quatro Bocas is still known to have more rainfall than Ipiranga, located 25 km southwest; the clouds of the rainy season move southward

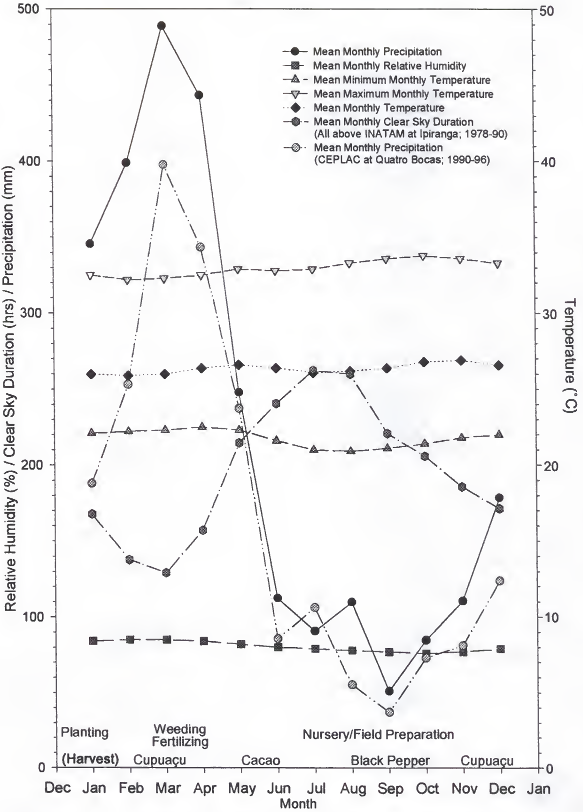


Figure 5-17. Average monthly climate and agriculture at Tomé-Açu

from the Atlantic Ocean to the interior. During this author's stay for two full years, farmers at Daini Tomé-Açu were suffering from prolonged dry seasons compared to those at Quatro Bocas and its vicinity.

The agricultural calender of the settlement is generally determined by the seasonal precipitation change, as is the norm in the Amazon. At the end of the rainy season in May, cacao harvest begins and lasts for two months. It is also the time to start preparing nurseries of fruit and timber trees. At the height of the dry season from August to October, farmers are busy harvesting black pepper. Meanwhile, those who plan to open new fields must slash the forest quickly for a good burn before the rains return. At the end of the dry season in November, harvest of cupuaçu begins and continues throughout the rainy season. December and January are months for field planting. During the rainy season, farmers fertilize crops (***adubação***), trim branches (***podação***) and clean parasites (***limpeza***), and clear grass (***roçada***) and weed (***capinação***). During this period this author often heard from farmers that agriculture in the Amazon is a continuous fight against weeds. Other crops such as passionfruit, acerola, and rubber latex all produce year round, while some seasonal changes were observed.

The crops cultivated by the Japanese-Brazilians at Tomé-Açu are summarized in Figures 5-18 ('major,' i.e., 'principal' and 'secondary' crops) and 5-19 ('minor' crops). The planted year of each crop and its cultivation types are listed in Appendices E and F. While the figures include all plants reported by the farm owners, many people did not mention species in their homegardens (see Chapter 4). Hence, the actual number of minor crops may be higher.

The 'principal' crops are those selected by ***CAMTA*** as the 'Five Major Crops of Tomé-Açu' for the Settlement Reconstruction 10-Year Plan (1985-94; see Chapter 3), plus recently increasing cupuaçu. The arbitrarily divided 'secondary' and 'minor' crops include timber tree species, and tropical fruit species promoted for the ***CAMTA*** juice factory (Chapter 3). In these figures, polyculture means a mixed-planting with other crop(s). However, the common shade trees for cacao plantations, namely eritrina and palheiteira, both leguminous, are not counted as crops. The majority of timber species typically are planted in polyculture, e.g., as cacao shade trees, substituting for eritrina or palheiteira.

Cupuaçu was typically planted at a wider spacing, about half as many stems per unit area, than cacao. These related species have similar physiological and morphological

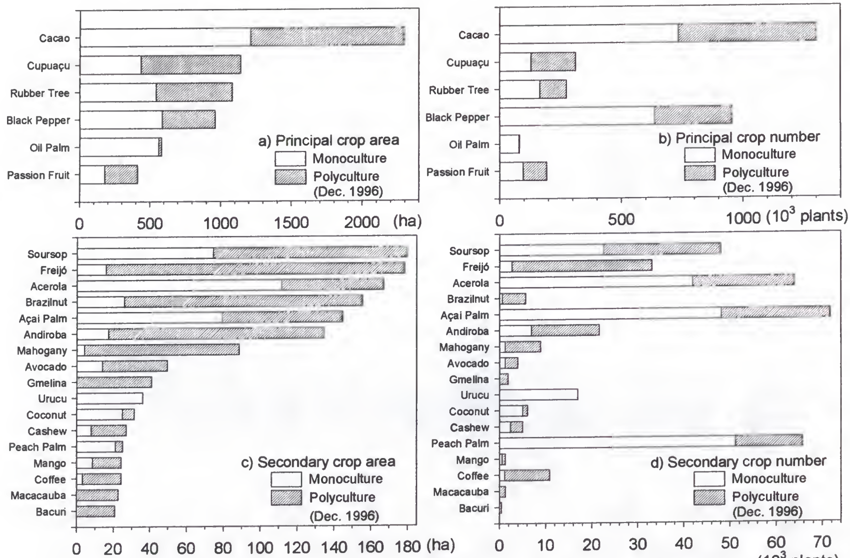


Figure 5-18. Major crops of Japanese-Brazilian farms at Tomé-Açu

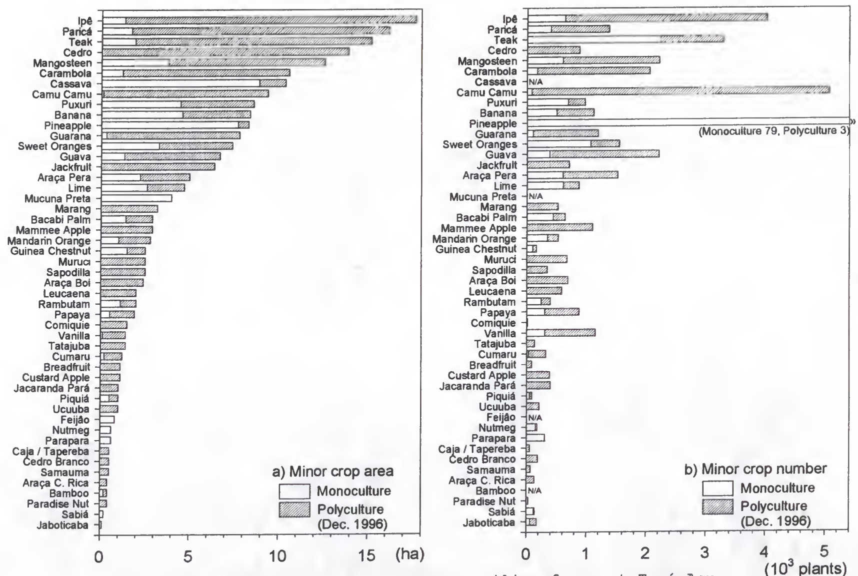


Figure 5-19. Minor crops of Japanese-Brazilian farms at Tomé-Açu

characteristics for cultivation purposes. Planting of the former became popular since the late 1980s after the international price of the latter dropped low (under US$ 2,000/t since 1989, according to Tanaka 1996). By that time, there was a technical evolution of local agroforestry to prefer and allow wider spacing of *Theobroma* trees. When cacao was re-adopted in 1970s as an alternative 'permanent' crop (see Chapters 3 and 4), it was placed in every fertilized pit of dead black pepper. However, after cacao trees grew up, the spacing (2.5 m X 2.5 m) was found to be too close. Some farmers thinned every other row of cacao. To avert such a wasteful cost, and for additional short-term income, farmers began temporary intercropping with Spanish melon and Hawaiian papaya. These species were planted in every other row of black pepper. Papaya provided moderate shade for *Theobroma* trees, that were spaced 5 m between rows and 2.5 m between trees.

As farmers gained more information on *Fusarium*, some farmers attempted better soil drainage to delay infestation. Black pepper rows were installed further apart (e.g. 3 m) at every second row for furrow space. Removed surface soil of the furrows was ridged between the paired black pepper rows. On top of the ridge, short-term crops were planted between young black pepper vines. After harvest, the short-term

crops were replaced by seedlings of fruit trees and multi-purpose trees (MPTs). Some farmers began planting fruit trees with 5 m distance between trees (i.e., skipping every other black pepper vine), so that an orchard spaced 5 m X 5.5 m (1.25 m + 3 m furrow + 1.25 m = 5.5 m between tree rows) would eventually develop. MPT species were intercropped by various distances (e.g., 12.5 m, 15 m, or 20 m between each tree and row) and arrangements (e.g., quadratic, triangular, or quincuncial) considering future shading of fruit trees. When black pepper died in the 5th or 6th year, passionfruit was planted in every other pit, and grew on wire running over the tops of the stakes (see Chapter 3). After three years of passionfruit production, the fruit trees (e.g., cacao or cupuaçu) had begun to close canopy, with moderate shade from the taller MPTs (e.g., brazilnut or paricá).

Tanaka (1997a and 1997b) notes that such a crop sequence over time characterizes the agroforestry of Tomé-Açu. In fact, almost all cupuaçu fields of Japanese-Brazilian farmers, either monoculture or polyculture, at the time of this author's inventory, had been created through this 'successional' agroforestry field management. This also applies to all other fruit tree species, and they generally had similar spacing used for cupuacu (5-6 m

between each tree and row) with a few exceptions (e.g., peach palm for palm heart production).

Takashi Nambu (1946-), the managing director of ***CAMTA*** (term 1993-97), gave an account of the start of such agroforestry practices (1995b). After the initial *Fusarium* panic in early 1970s, farmers planted various alternative crops in the fertilized pits of dead black pepper. Those familiar with clean culture in Japan simply could not allow their sweated field to return to secondary bush (***capoeira***). As time passed, *Fusarium* attack on black pepper became an expected event, and farmers began to plan ahead for other crop sequences. They advanced planting of successor crops while black pepper vines were still alive, and found it efficient in terms of simultaneously attending several crops (see Appendix L). Eventually, they planted black pepper and successor crop(s) at the same time, so that the latter would reach full production soon after the extinction of the former. Through individual trial and error, farmers exchanged ideas to optimize spacing, fertilizer application, and general work efficiency.

However, it was a long time before government officials became supportive to their initiatives (Ōnuki 1995b). The specialized institutions such as Superintendency of Rubber Culture Development (***SUDHEVEA*** [***Superintendência do***

Desenvolvimento da Heveacultura]; merged into ***IBAMA*** in 1989) did not allow intercropping with species outside of their bureaucratic domain. The officials were impressed by the good growth of rubber trees in old black pepper fields, but rejected rubber planting finance if intercropped with black pepper. They were afraid that farmers would only take care of black pepper and neglect rubber trees. Even so, Japanese-Brazilian farmers applied their ideas to every imaginable crop combination (Appendices G and H). Besides innovative farmers (*tokunō*) mentioned in the previous chapter, there were many ***isseis*** at Tomé-Açu who had experience in intensive fruit culture and forestry as separate cropping systems in Japan. On exposure to cacao under shade trees, they developed an 'agro-forestry' in the humid tropics involving various fruit and timber species (see Chapter 4).

Recent Economy of Tomé-Açu Cropping Systems

The agroforestry practice of Tomé-Açu has often been cited as an example of sustainable land use in the Brazilian Amazon (Jordan 1986; Gradwohl and Greenberg 1988; Uhl and Subler 1988; Uhl et al. 1989; Anderson 1990; Barros, 1990; Barrow 1990; Subler and Uhl 1990; Uhl et al. 1990; Serrão and Homma 1993; Subler 1993; Fearnside 1995; Serrão 1995).

This discussion is mainly based on the fact that Japanese-Brazilians there have been cultivating the same soil for decades by relatively small operations. However, little information has been available on economic aspects of their agriculture, except for ***CAMTA***s annual product receipt statistics (***Recebimento de Produtos***) for each associate. Such information is crucial in assesing the viability of Japanese-Brazilian systems as alternatives to extensive production approach.

Hence, this author conducted a one-year survey on inputs and outputs of major cropping systems at Tomé-Açu (see Figure 5-18). The ***CAMTA*** associate register (***Cadastro Geral***) of ***ATEA*** was consulted first to select sample crops and farms. However, success of the survey hinged on the cooperation of farm owners, who would receive this author's weekly visits for a year. After discussions with the ***CAMTA*** board, Toshihiko Takamatsu (1944-), in charge of the Education Commitee (***CATES***), took me around the settlement to negotiate with potential volunteers. Sample crops and farms were finalized as in Table 5-1. The farm owners were ***CAMTA*** associates, with the exceptions of Eikawa, Harayashiki, and Takahashi. This list excludes two rubber plantations and an açai grove initially included, because the owners suspended production before the one year survey period was over.

Table 5-1. Sample crops and farms for annual record keeping

Base Crop	Farm (Abbreviation/ Residential District)	Association	Year Planted	Area (ha)	Plant-ed #	Pres-ent #	Per ha #
Açai	Itō, Q. (IQ / IT)		-	2.25	-	-	-
	Sakaguchi (SG / TA)		-	31.5	-	-	-
Acerola	Sasaki, Yū. (SK / BR3-7)		1991-92	2	1500	611	306
	Oppata (OP / BR4-6)		1994	2	900	850	425
	Takamatsu (TM / MQ)		1992	2	580	580	400
Black Pepper	Hiramizu (HZ / IR)	black pepper	1991-92	4.5	-	5000	1111
		cupuaçu	1991		1000	1000	233
	Konagano (KG / BR3-7)		1992	7	-	10000	1429
	Ōnuki (ŌN / IR)		1990	16	-	10000	625
	Suzuki (SZ / MQ)	black pepper	1991	5	-	5500	1100
		cupuaçu	1994		-	876	175
Cacao	Eikawa,Yu. (EK / BR1-2)		1975-84	17.5	13746	10000	543
	Inada, K. (IN / BR4-6)		1975-86	23.5	23361	15680	667
	Kondō (KD / AR)	cacao	1965-73	19	19000	7850	413
		rubber tree	1965-73		-	3050	161
	Ōnuki (ŌN / IR)	cacao	1974-85	20.9	20900	16100	770
		timber trees	1974-86		-	3596	172
	Sakaguchi (SG / TA)	cacao	1970	0.5	250	247	494
		timber trees	1970-82		-	387	774
	Sasahara (SH / IR)	cacao	1980	1.75	800	1135	649
		timber trees	1980-85		-	427	244
	Suzuki (SZ / MQ)		1975	14	7815	6815	487
	Takahashi (TH / IR)	cacao	ca.1986	16.8	4480	4360	260
		rubber tree	ca.1974		7600	6400	381
Cupuaçu	Itō, J. (IJ / BR4-6)		1987-89	13	4000	3600	277
	Konagano (KG / BR3-7)		1988	7	2700	2500	357
	Maki (MK / CX)	cupuaçu	1977	2	800	772	386
		timber trees	1974-81		-	393	197
	Sasaki, Yū. (SK / BR3-7)		1988	1	888	624	624
	Tanaka, I. (TN / BR1-2)		1986-87	5	2000	1200	240
Passion-fruit	Hashimoto (HM / BR1-2)	passionfruit	1994	4.5	2300	2300	511
		cupuaçu	1992		-	840	187
		cupuaçu	1995		-	128	28
	Itō, J. (IJ / BR4-6)		1994	3.5	3189	3189	911
	Miyagawa, F.M. (MY / BR4-6)	passionfruit	1994	2	1000	1000	500
		cupuaçu	1992		-	510	255
		brazilnut	1991		-	40	20
	Takahashi (TH / IR)	passionfruit	1994	12.5	6000	6000	480
		cupuaçu	1996		seeded	-	-
		brazilnut	1978		-	40	3
Pasture	Harayashiki (HR / BR5-8)		1980-95	876.5	-	-	-
	Ōnuki (ŌN / IR)		1987-95	400	-	-	-
	Takahashi (TH / IR)		1976-95	1172	-	-	-

Note: Survey conducted from September 1995 through August 1996, except Black Pepper (August 1995-July 1996) and Acerola (January 1996-December 1996). Timber trees include some non-timber species (see *[1] of Table 5-4). Farm abbreviations are used in subsequent tables and figures.

The survey period was from September 1995 to August 1996, except for black pepper (August 1995-July 1996) and acerola (January-December 1996). During this period, the Brazilian currency was Real (R$). Its foreign exchange rate to the US Dollar (US$) declined slightly (Table 5-2), but remained about 1:1. There was an increase in the legal minimum salary (***salário mínimo***) on May 1, 1996 from R$ 100/month to R$ 112/month. These served as the basis for setting the weekly wages of unskilled rural laborers, regardless of their status (temporary or permanent) or wage calculation method (time wage or piece rate). In addition, there were three major legal allowances for permanent laborers. Local people usually called them 1) the 13th Month Salary (***Dessimo Terceiro Salário***), 2) Vacation Month Allowance (***Férias***), and 3) the Indemnity (***Indenização*** in place of ***FGTS*** [***Fundo de Garantia por Tempo de Serviço***] installments). Officially, there were complex regulations on each allowance payment. However, in rural areas, both employers and employees preferred easier wage settlements. Thus, most permanent farm laborers received an annual supplement in cash, equivalent to their three-month salaries for the total of the three allowances. Hence, minimum monthly salary for a single adult permanent laborer,

adjusted by the extra annual allowances was R$ 125 until April 1999, and R$ 140 thereafter. For example, a farm owner reported weekly wages such as: "employee A was paid 1.5 salaries, R$ 2.65 of additional tip (***abono***), R$ 2 of family allowance, and R$ 6 of overtime (by higher rates)." In this case, the adjusted weekly wages of '1.5 salaries' before May 1996 were R$ 125 X 1.5 ÷ 30 days X 7 days = R$ 43.75, and this laborer's regular hour rate was (R$ 43.75 + R$ 2.65 + R$ 2) ÷ 44 hours = R$ 1.1.

Table 5-2. Shift of Real (R$) exchange rate per US$ 1

Date	Buying		Selling		Date	Buying		Selling	
	Com.	Paral.	Com.	Paral.		Com.	Paral.	Com.	Paral.
95/08/31	0.947	0.949	0.955	0.950	96/04/30	0.990	0.980	0.992	1.010
09/29	0.950	0.952	0.955	0.953	05/31	0.998	1.015	0.998	1.020
10/31	0.961	0.950	0.962	0.960	06/28	1.003	1.020	1.004	1.030
11/30	0.964	0.968	0.964	0.973	07/31	1.012	1.030	1.013	1.035
12/27	0.973	0.985	0.970	0.995	08/30	1.016	1.028	1.016	1.033
					09/30	1.020	1.033	1.020	1.038
96/01/31	0.978	0.975	0.977	0.982	10/31	1.027	1.085	1.027	1.095
02/29	0.984	0.978	0.985	0.983	11/29	1.032	1.085	1.032	1.095
03/29	0.988	0.985	0.988	0.990	12/23	1.038	1.115	1.038	1.125

Source: Nippaku Mainichi Shinbun (Diario Nippak), São Paulo, Brazil. Com. = commercial, and Paral. = parallel market.

Gross Income

The per hectare gross income in Figure 5-20 includes annual sale, and stock increase in cattle weight and timber tree stem volume. Though planting arrangements and crop treatments varied by farm in each crop, there was a noticeable income tendency by different crops. Table 5-3 includes

gross income calculation of three ranchers. Table K-9 of Appendix K contains categorized animal numbers and weights.

Table 5-3. Stock increase and gross income of Japanese-Brazilian ranchers at Tomé-Açu (Sept. 1995-Aug. 1996)

Item and Unit	Harayashiki	Ōnuki	Takahashi
Area (ha)	876.5	400	1172
Initial Stock (kg/ha)*1	335.68	254.13	229.04
Final Stock (kg/ha)*1	327.93	285.73	289.32
Annual Stock Increase (kg/ha)	-7.75	31.6	60.28
Annual Liquidation (kg/ha)	107.61	67.4	48.5
Manure (kg/ha)	n/a	n/a	15.36
Initial Stock (R$/ha)*2	239.53	182.8	167.35
Final Stock (R$/ha)*2	229.94	203.92	210.09
Annual Stock Increase (R$/ha)	-9.59	21.12	42.74
Annual Liquidation (R$/ha)	86.12	53.57	38.03
Manure (Self; R$/ha)	n/a	n/a	0.46
Annual Gross Income (R$/ha)*3	76.53	74.69	81.23

Note: Excluded 25 ha of Takahashi leased to his friend, and 96.2 ha of Harayashiki created during survey period (not grazed yet). Lacking grass, Harayashiki and Ōnuki rent extra pasture of ***Fazenda Nippaki***, which this author treated as fodder purchase (cf. Table K-9 of Appendix K).

*1 Number of animals of each category multiplied by the mean weight used by the ranchers: bulls (***toros***) 450 kg; oxen (***bois***), male weanlings (***garrotes***), cows (***vacas***) and heifers (***novilhas***) 300 kg; new male weanlings and heifers of the year 250 kg; calves (***bezerros*** and ***bezerras***, < 8 months) 120 kg; sheep (***carneiros***) 20 kg; horses (***cavalos***) and mares (***eguas***) 200 kg; donkeys (***burros***) and she-mules (***mulas***) 150 kg; and colts (***potros***) 100 kg.

*2 Weight difference of initial and final stocks multiplied by the average local price of live animal: R$ 0.78/kg for all male cattle; R$ 0.68/kg for all female cattle; R$ 0.75/kg for sheep; R$ 300/head of horses and mares; R$ 200/head of donkeys and she-mules; and R$ 150/head of colts.

*3 Annual Stock Increase + Annual Liquidation + Manure (transfer to crop sector).

Table 5-4 gives the estimated monetary value of timber stock increase based on local stumpage prices at that time. The bases of this calculation are provided in Appendix I, and

Table K-6 of Appendix K. Timber values would only be realized when trees are harvested in the future. Considering forest resources of the world and of this part of the Amazon in particular, the market price of standing timber is likely to soar in the long run.

Table 5-4. Estimated timber stock of Japanese-Brazilian agroforesters at Tomé-Açu (1996)

Item and Unit	Ōnuki	Sakaguchi	Sasahara	Maki
Base Crop Area (ha)	Cacao 20.9	Cacao 0.5	Cacao 1.75	Cupuaçu 2
Intercropped Timber Species *1 Tree Density (#/ha)*2	Andiroba, Brazilnut, Cedro, Freijó, Gmelina, Macacauba, Mahogany 170	Andiroba 364	Andiroba, Brazilnut, Freijó, Macacauba, Mahogany 237	Freijó, Macacauba 176
Stem Wood (m^3/ha) *3 (R$/ha)	41.11 2,586.09	190.00 8,550.16	109.22 10,638.69	46.79 2,525.18
Increment (m^3/ha/year) *4 (R$/ha/year)	1.59 103.73	19.39 872.61	8.56 1,237.32	2.78 124.95

*1 Non-timber species for fruits, nuts, latex and shade were excluded. Volunteer timber trees with unknown age could not be assessed for annual growth, while most of them were small in size and few in numbers (cf. Table K-6 of Appendix K). Noticiable species among excluded are cumaru of Sakaguchi (38 trees/ha; stem 12.84 m^3 = R$ 577.74/ha), and tatajuba of Sasahara (5 trees/ha; stem 1.39 m^3 = R$ 62.69/ha) and Maki (2 trees/ha; stem 0.92 m^3 = R$ 41.47/ha).
*2 Timber trees of Ōnuki were planted by various spacements (see Tables K-5 and K-6 of Appendix K).
*3 Stem Wood estimate is based on field data collected during February-April 1996 (midpoint of economic survey).
*4 Annual Increment calculation derives from Appendix I, for which original data were sampled during September-December 1996. Hence, stem wood increments during this economic study period are substituted by the values of Year 1996. Species planted over several years of period are represented by the mean age trees.

As can be seen in Figure 5-20, the pastures generated less gross income per hectare than any other production systems. Even semi-natural açai groves along small streams, requiring only harvest labor to maintain, generated more. (Açai was allegedly introduced by ***Cametaenses***, the migrant black pepper field workers, and dispersed by birds.)

Income from cacao sales was low mainly due to stagnant prices since the late 1980s. Farmers had not applied fertilizer for years. Under such conditions, cacao fields with intercropped rubber and timber trees yielded more, even though overshading might have reduced cacao production (see Appendix J). Timber stock increase at Sasahara Farm came chiefly from mahogany and, at Sakaguchi Farm, from andiroba. Medicinal andiroba seed oil, a traditional non-timber forest product earned additional income for Sakaguchi. Ōnuki and Maki had little from timber growth, due to poor performance of freijó. It seems that, if appropriate species and planting methods are chosen, and fire is controlled, timber trees can contribute significantly to the long-term farm finance.

Gross income reports for passionfruit varied widely among the sample farms due to the following facts. During the survey period, the owner of Hashimoto Farm was hospitalized in Japan for major cancer surgery, and farm

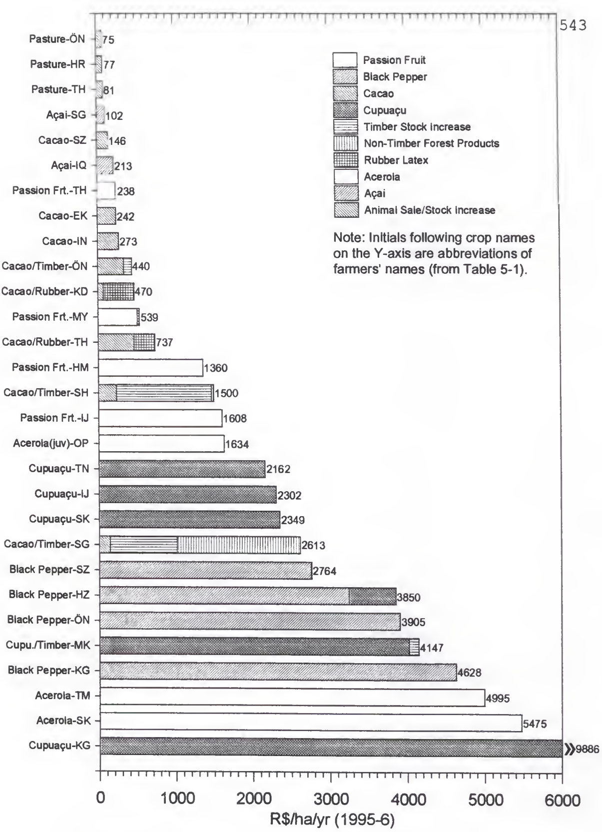


Figure 5-20. Gross income of major crops at Tomé-Açu

management was left to his young son. Miyagawa Farm's crop was the second one, and the owner was growing it as a companion to intercropped cupuaçu. Takahashi Farm made serious efforts, but had little production. The owner asked ***ATEA*** of ***CAMTA*** to diagnose the problem, which nonetheless persisted through the year. There was a rumor that passion-fruit wouldn't produce at Daini Tomé-Açu, and this author saw other unproductive farms there that year.

Cupuaçu sales were close in three farms (Tanaka, J. Itō, and Sasaki), all having trees of similar ages. Maki Farm's trees were much older, but were shaded by inter-cropped timber trees. Konagano Farm had an exceptionally hard working owner, Michinori Konagano (1958-), a board member of ***CAMTA***. Through cooperation with cupuaçu survey projects of ***EMBRAPA-CPATU***, which used his fields for trials and demonstrations, Konagano acquired tips for technical improvements. From January 25 to 26, 1996, ***Globo Rural***, a popular Brazilian TV program on rural industries, was filmed at Konagano Farm. The program was broadcast nationwide several months later, introducing cupuaçu culture from nursery to harvest, and processing of various cupuaçu products, e.g., sweets, juice, jam, ice cream and 'cupulate' (chocolate made of cupuaçu seeds) by ***CAMTA*** associate women.

Farmers of Tomé-Açu hoped the publicity would accelerate development of markets in the southern Brazil. Michinori Konagano mentioned his high yield '80% profit' in the program, prompting Brazilians from different regions to order cupuaçu seeds from ***CAMTA***. Although Tomé-Açu was still a major production center (Oyama 1996), cupuaçu was spreading through the Amazon due to the promotion by the public Company for Technical Assistance and Rural Extension (***EMATER***) with institutional financing. With hopes of opening up international markets, ***CAMTA*** shipped fruit pulp to a European exhibition in Spain that year.

Black Pepper, the traditional product, was still a good bread-winner. Hiramizu and Suzuki intercropped cupuaçu, which started producing before black pepper vines were killed by *Fusarium*. The owner of Suzuki Farm was absent for most of the survey period, working in Japan and leaving farm management to his son, a recent graduate of the ***FCAP*** Forestry Department. On returning home in June 1996, the owner resumed farming, and said he would work hard to restore crop production. Konagano's field was located on a new soil just outside of the settlement, where he hired a caretaker throughout the year. The owner family members commuted from time to time to supervise and provide inputs.

Aside from Konagano's cupuaçu, acerola was the top producer. Oppata's field was still immature, but will start producing as those of Takamatsu and Sasaki have within two years. Because the berry is vulnerable to bad road conditions, the acerola fields were all within a certain distance from the ***CAMTA*** juice factory at the Agua Branca District. At Daini Tomé-Açu, where acerola was first introduced by ***INATAM***, few farmers planted them beyond the capacity of home pulp processing.

<u>Costs</u>

In calculating costs, depreciation of large farm machinery was excluded, e.g., of trucks, tractors, and bulldozers. All of those being used in the surveyed farms were over 10 years old (including a 32-year-old tractor) with an 8-year-old truck the only exception. Because of Brazil's chronic inflation, farmers did not remember the machinery price except in terms of 'xx tons of black pepper to purchase.' Besides, the machines were shared by all sectors of a farm, so that the cost bearing of each crop or ranch would be extremely difficult to calculate. For the same reason, depreciation of infrastructure was excluded, e.g., of barns, laborer sheds, and fruit processing

facilities. Concerning ranches, Mattos and Uhl (1994) reported US$ 14.67/ha for installation of fences, troughs, and gates at neighboring Paragominas. This could be paid off by US$ 1.47/ha/year for 10 years. In place of depreciation, this author recorded the actual annual expenses of pasture, i.e., gates, fences, troughs, wells and grass (planting and replanting). This author assumed that the owners were making rational decisions on these expenses, to equilibrate grass production for their constantly changing herds, while maintaining a stable profit. The presence of rental pastures nearby seemed to increase their flexibility to deal with these variables. During the survey period, the ranching sector of three farms was financially independent from other sectors. Hence, it was further assumed that resource allocation on pasture lands would be constant within a narrow range of the annually liquidable stock in these 'non-specialized' self-reproducing ranches.

Figure 5-21 shows the costs incurred in producing the major crops on the sample farms. Acerola was the most labor intensive crop. Among black pepper fields, Konagano's recorded the highest labor input (due to the cost of a caretaker) and had the largest yields. Cupuaçu orchards require less labor than passionfruit, black pepper, or acerola. Cupuaçu harvest is simply the collection of large

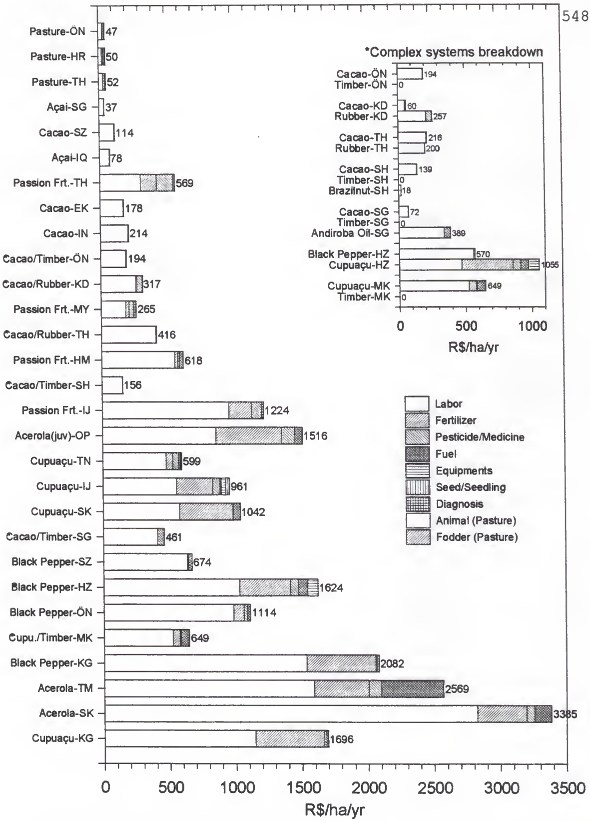


Figure 5-21. Production cost of major crops at Tomé-Açu

fallen fruits (1-2 kg each; see Appendix L). Because of the ease of harvest and a good market, local cupuaçu producers claimed they were losing up to 50% of production to night thefts. Konagano appropriated 10% of production as 'theft cost' in his financial plan. Fertilizer inputs were high in acerola, black pepper of Konagano, and, except for Tanaka and Maki, cupuaçu. According to Maki, his cupuaçu under timber trees had been receiving the same level of agricultural inputs for constant production over the years. Fuel consumption was highest in acerola due to irrigation and frequent shipments to the ***CAMTA*** juice factory. The three ranching operations spent the least money per hectare except for semi-natural açai of Sakaguchi.

Figure 5-22 shows the rate of non-labor inputs per gross income of each system. Takahashi's passionfruit yielded little despite use of costly fertilizer and pesticide. Hiramizu and Oppata were investing in future production of juvenile cupuaçu and acerola, respectively. Other than such exceptions, agricultural material inputs, mainly fertilizer and pesticide, were under 20% in all crop systems. In this sample, black pepper received less fertilizer than is usual at Tomé-Açu. Hiramizu was anticipating high mortality of the vines in the following year, and fertilized intercropped cupuaçu only. Suzuki's

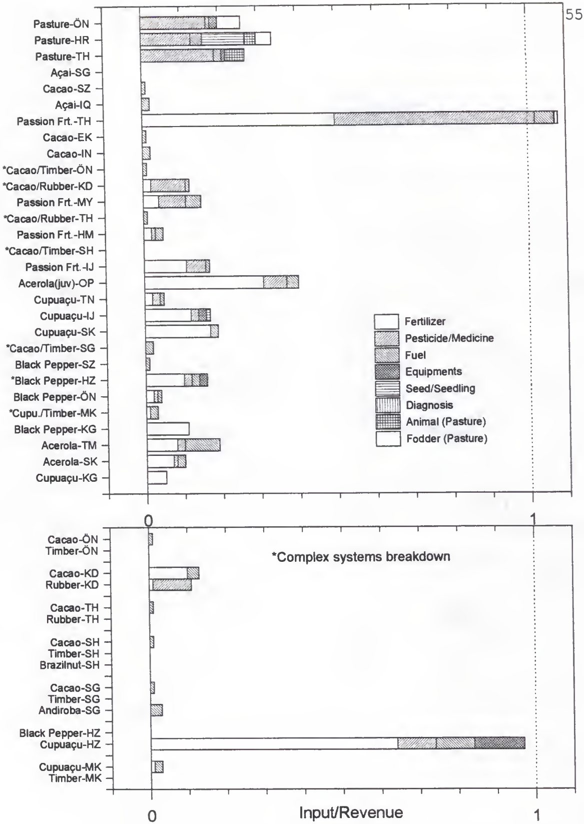


Figure 5-22. Non-labor cost rates to gross income

young son simply could not handle all of his father's farm, while having his own business at Quatro Bocas and various voluntary duties in the Japanese-Brazilian community. Cacao's only non-labor cost was tractor fuel for harvest transportation and weed clearing (***roçada***). Kondō was the sole exception, with a little fertilization. For his rubber tree enterprise he also used acetic acid as a rubber latex coagulant. Takamatsu's high fuel use on acerola was chiefly for water pumping to mitigate the drought of that year. On the other extreme, Konagano's cupuaçu and black pepper, and Sakaguchi's açai required so little transportation fuel relative to gross income, that it does not even show on the graph.

Resource allocation looks quite different in pasture systems, where expenditures on non-labor inputs equaled 26-34% of gross income. The largest share went to medicines for cattle and horses. Ōnuki and Harayashiki lacked grass and moved part of their herds to ***Fazenda Nippaki*** for grazing. Subsequently, Harayashiki sold male calves (see Table K-9 of Appendix K), and bought seed to create new pasture. Takahashi and Harayashiki purchased bulls to replace old ones. There was no material input for pasture improvement, except Takahashi's use of a little herbicide (Tordon) to kill unwanted trees.

Figure 5-23 shows the ratio of wage labor cost to gross income, excluding owner labor. In general, in this sample, the crop with the highest labor cost was acerola, followed by black pepper and cupuaçu. Hiramizu's intercropped young cupuaçu was an exception. Konagano's black pepper had a caretaker, thus the high labor cost. J. Itō left his farm management with the foreman (***capataz***), and did only weekend supervision (farm observation, hearing work reports from the foreman, and paying wages to laborers). J. Itō was elected a ***CAMTA*** board member in charge of marketing, so that he could not stay home in the weekdays. This raised labor costs of his cupuaçu as well as passionfruit. Tanaka relied mostly on his own family labor for his cupuaçu enterprise. The same applies to Hashimoto in passionfruit, Sasahara and Inada in cacao, and Q. Itō in açai. Wage labor costs were consistently high in cacao and rubber, chiefly due to low product prices. The labor costs ranged from 35% to 70% in cacao, and from 50% to 70% in rubber. In pasture systems, 28-36% of gross income went for wage labor (a few cowboys and weeding contractors). Gender analysis of labor is discussed in later sections of this chapter.

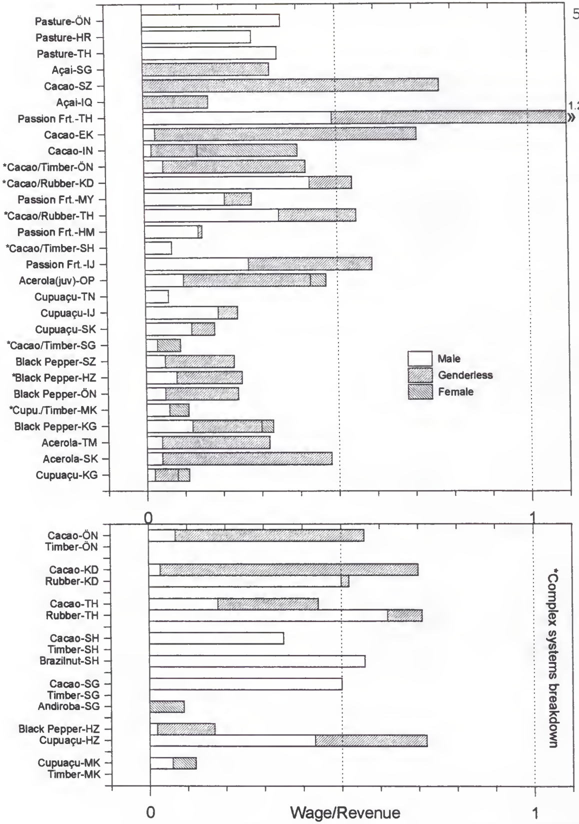


Figure 5-23. Laborer wages to owner gross income

Net Income

After deducting paid costs, the remainder of gross income went to the owners as self wages and profits (Figure 5-24). All three ranchers netted 38% of gross income. Açai was a profitable crop with little cost, 'a major cash income source' for Sakaguchi. Cacao net income ranged from 17% for Kondō up to 59% for Inada and 64% for Sasahara. In the latter two farms, owner family members worked for cacao harvest and processing. Many farmers at the settlement, such as Sakaguchi, were trying to keep at least 50% to themselves by using share contractors (***empreiteiros***). However, after all, some of them ended up with less than 50% due to loss of cacao beans to theft, cheating, or bilking by contractors who borrowed money from middlemen by mortgaging the over-estimated harvests. Thus Eikawa gained net income of only 28%, and Suzuki ended with 22%. Passionfruit net income varied widely, from Takahashi's deficit to Itō's 25% to Hashimoto's 81%. Acerola was a lucrative crop, but profit rates were below 50% due to the necessity for numerous fruit pickers. Takamatsu paid pickers R$ 0.06/kg, Oppata R$ 0.07/kg, and Sasaki R$ 0.08/kg. Again, Oppata's acerola was young and not in full production. Black pepper profit ranged from 56% for Konagano's, which had the most

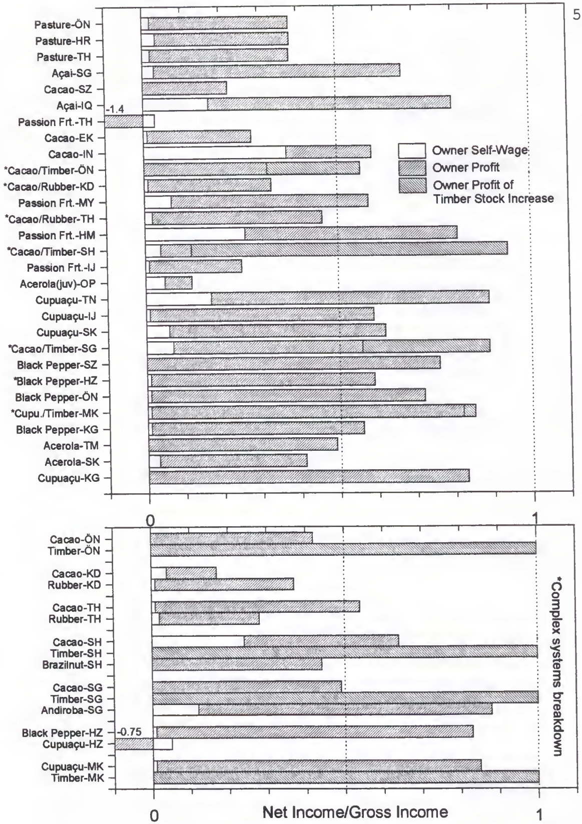


Figure 5-24. Owner self-wage and profit rates to gross income

intensive care and highest production, to 76% for Suzuki's, with low input and output. Excepting Hiramizu's immature trees, highly profitable Cupuaçu netted farmers 59% to 89%. Tanaka collected fruits himself frequently, because Hashimoto, his neighbor, was suffering from squatters who specialized in night-picking.

Finally, the contribution of timber trees should be mentioned. No cost is deducted from stock increase, as farmers did not thin or prune. There were no fertilizer applications. Future harvest will be done by lumberjacks, leaving little work to clean up the ground. The two agroforestry leaders at Tomé-Açu, Sakaguchi and Sasahara, thus netted the highest portion of gross income, 89% and 94%, respectively. This was also due to the valuable timber species they planted, andiroba and mahogany, respectively. Also, the cacao price was low and farmers spent a minimum on cacao cultivation in that period. Sakaguchi and Sasahara were from central and northern mountain villages of Japan. They had grown up seeing their parents planting trees on hillside taungya fields for their grandchildren (see Chapter 4). They also witnessed at home how much those planted trees would yield when harvested. Hence, they were confident in agroforestry that included long-term investment

in timber trees, although for the time being, tangible income flow each year was limited to non-timber components.

The owners' per hectare net income, consisting of self wages and profits, is summarized in Figure 5-25. Ranchers earned R$ 28-31/ha with the mean of R$ 29/ha. Cacao varied from R$ 12/ha for Kondō to R$ 254/ha for Takahashi, with the mean of eight farms being R$ 111/ha. Intercropped rubber trees earned R$ 78/ha for Takahashi and R$ 146/ha for Kondō. Açai rendered R$ 68/ha for Sakaguchi and R$ 172/ha for Q. Itō. Sakaguchi was suspected of giving up a sizable harvest to tresspassers, because his farm is located close to town. For this same reason, Q. Itō excluded a portion of his açai grove from record keeping. Rural residents adore this 'natural and ownerless' palm to the point that they break fences to get it, causing ranchers eliminate açai from their properties.

The net income of passionfruit varied from R$ -332/ha for Takahashi to R$ 1,100/ha for Hashimoto. Miyagawa and J. Itō had R$ 300-400/ha, slightly higher than the earnings of cacao fields. Farmers were prone to consider this vine only as a 'relay crop' while crop trees are still small. They know from experience that both yields and markets vary widely and unpredictably from year to year. ***CAMTA*** was encouraging both associates or non-associates to plant

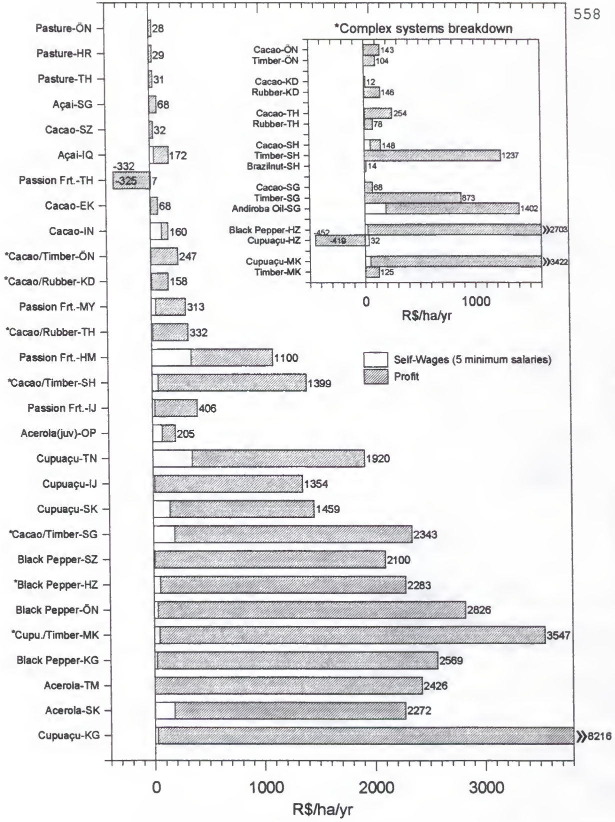


Figure 5-25. Owner self-wages and profits

passionfruit for the juice factory. However, local producers did not respond well, forcing the cooperative to purchase fruit from other municipalities. Cupuaçu rendered as low as R$ 1,354/ha for J. Itō to R$ 8,216/ha for Konagano. The average of Tanaka, J. Itō and Sasaki gave R$ 1,578/ha, that seemed the norm of a mature 10-year-old field without intensive care.

The range of black pepper was narrow from R$ 2,100/ha for Suzuki to R$ 2,826/ha for Ōnuki. It was probably because this traditional crop, unlike cupuaçu, had proven, standard cultural practices. Even Suzuki's field without fertilizer application and little weeding in the survey year, apparently benefitted from the residual effects of treatments of the previous years.

Acerola net income was about the same as black pepper, with R$ 2,272/ha for Sasaki and R$ 2,426/ha for Takamatsu. However, according to the producers, an essential difference lies in the income flows of these species: acerola provides operating funds while black pepper creates investment capital. The former bears berries all the year round, while the latter produces fruits once a year, but which could be stored for years after on-farm processing. Timber tree agroforestry of Sasahara achieved the level of cupuaçu with R$ 1,399/ha. Sakaguchi gained R$ 2,343/ha to the level of

black pepper and acerola. Again, these values include timber stock increase, which they could actually liquidate in the future (see Complex systems breakdown of Figure 5-25). Besides, most of Sakaguchi's profit derived from andiroba oil, for which production was limited to the surveyed 0.5 ha out of his 18 ha of andiroba forest. This was chiefly due to local market limitation, and secondarily, labor availability of family members to handle the critical portion of processing.

Concerning self-wages, all work done by Japanese-Brazilian owner family members was evaluated by the standard of the adjusted 5 legal minimum salaries (i.e., R$ 625/month until April 1996, and R$ 700/month thereafter). This was the compensation to ***CAMTA*** board members, being drafted from their farms to the cooperative office by election. Generally speaking, most Japanese-Brazilian owners could be characterized as administrators rather than laborers themselves. This is especially true on large farms. Thirty years since the survey of Staniford (1973) during 1964-65, they had grown to ***patrões*** not depending so much on family manual workforce. Internal immigrants from Cametá, Pará, and Nordeste, initially lured by the black pepper economy, had created numerous hamlets providing abundant labor.

Owners still operated the machinery on many farms. Typically the farm owner would go to a field on a tractor pulling a grass cutter, disk harrow, or glassfiber tank. He would clear, cultivate, irrigate in drought, or spray chemicals, while overseeing laborers. However, this does not show up in Figure 5-26 (top), because owners circulated among many fields in addition to the surveyed ones. At harvest, farm owners transported pickers and fruits to and from the field on their trucks (Figure 5-26 bottom). Elderly family members took part in farmyard processing, such as Inada and Sasahara's cacao fermentation, Sakaguchi's andiroba seed-oil extraction, and Konagano's black pepper drying (Figure 5-26 bottom). Although it was not encountered in the sample, old people of the settlement were often found inside the house extracting cupuaçu pulp with scissors. Final products were shipped by the owners to Quatro Bocas, or to the ***CAMTA*** juice factory at Agua Branca. On ranches, owners performed supervision, accounting, and took supplies to cowboys. They also purchased livestock medicines, attended vaccination and weighing, and negotiated with traders. Harayashiki brothers prepared land for new pastures with a tractor and a bulldozer. The rancher self-wages per hectare are negligible (Figure 5-26 top). However, they were busy. Their challenging tasks require

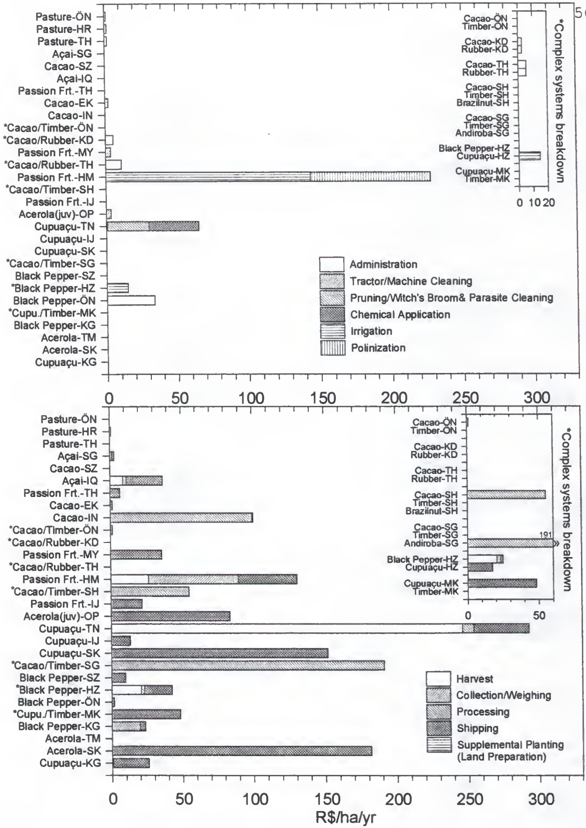


Figure 5-26. Owner assignments

special skills, i.e., ability to visualize a bird's eye view of the extensive glassland, basic veterinary skills, sharp trading techniques, ability to keep cowboys under control, etc. These are not skills that were brought from Japan. An irresistible attraction of ranching for enterprising immigrants and ***nissei*** successors might be rooted around here, i.e., novelty to their farming tradition and the dynamic management compared to crop agriculture.

Figure 5-27 shows the land area of each of the sample fields needed to produce standard net income (equivalent of the adjusted 5 minimum salaries) for a farm family member. The pastures required 253-275 ha. Cacao monoculture fields varied from as low as 49 ha for Inada to 244 ha for Suzuki. Cacao and rubber intercropped fields had 24 ha for Takahashi and 49 ha for Kondō. Cacao and timber fields were 3 ha for Sakaguchi, 6 ha for Sasahara, and 32 ha for Ōnuki. Ōnuki had the lowest density of timber trees, with few vigorous individuals of valuable species, and without non-timber products. All mature acerola, black pepper, and cupuaçu fell in the range of 1-6 ha.

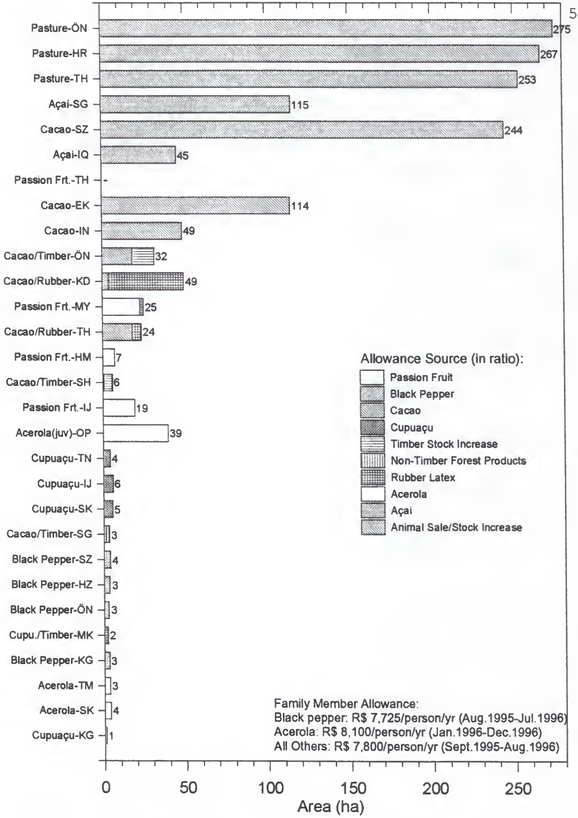


Figure 5-27. Area for a family member allowance

Laborer Income

Rural laborers consisted of permanent employees and temporary workers. Basic salaries differed by years of service and positions, up to twice the minimum salary per farm foreman (***capataz***), and four-times the minimum salary per ranch manager (***gerente***). Farm owners added bonuses of up to 80% of minimum weekly wages. If an employee was helped by his dependents on farm, he was paid extra according to the kind of work. Time wage (***diária***) was paid by hours of labor, which farm owners preferred for tasks requiring care, while piece rate (***empreita(da)***) was opted for the tasks requiring speed. The latter was often applied to temporary laborers at harvest, when compensation was paid by the weight of collected fruits. Occasionally a permanent laborer was also assigned work by piece rate, by which he could earn more than his regular salary. As far as this author noticed during 1995-96, there were only a few cases of a farm hiring a female permanent laborer, except as a house maid. One exception was Sakaguchi Farm where a woman was handling the same field work as the male laborers.

Farm employee assignments by gender are shown in Figures 5-28 and 5-29 (male laborers), 5-30 (genderless = male & female laborers), and 5-31 (a; female laborers, and

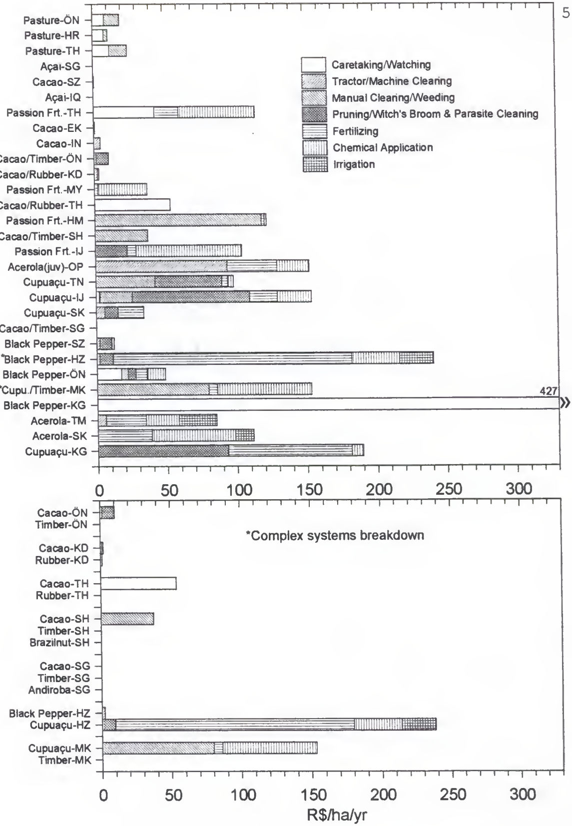


Figure 5-28. Male laborers' assignments #1

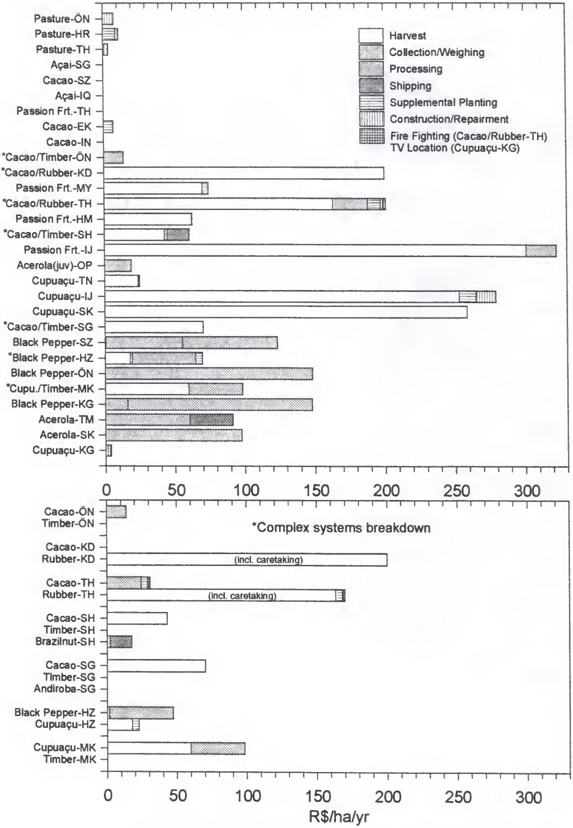


Figure 5-29. Male laborers' assignments #2

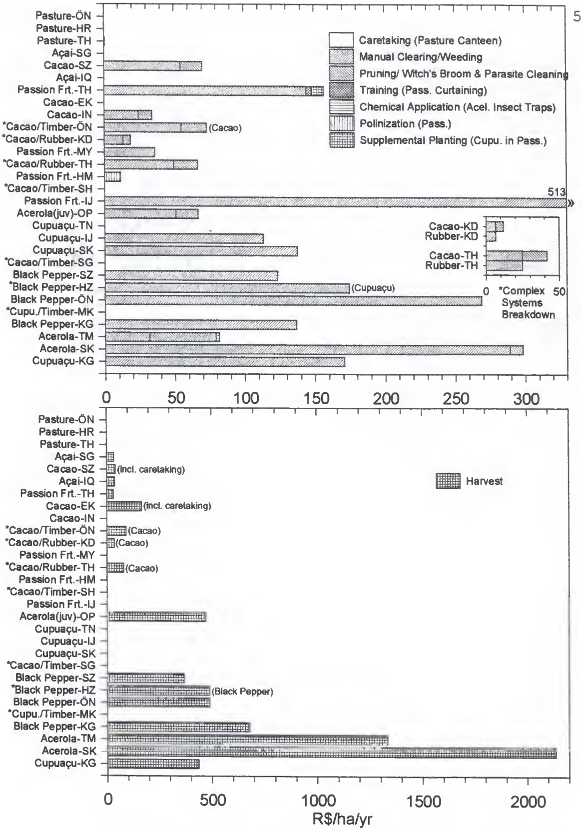


Figure 5-30. Genderless laborers' assignments

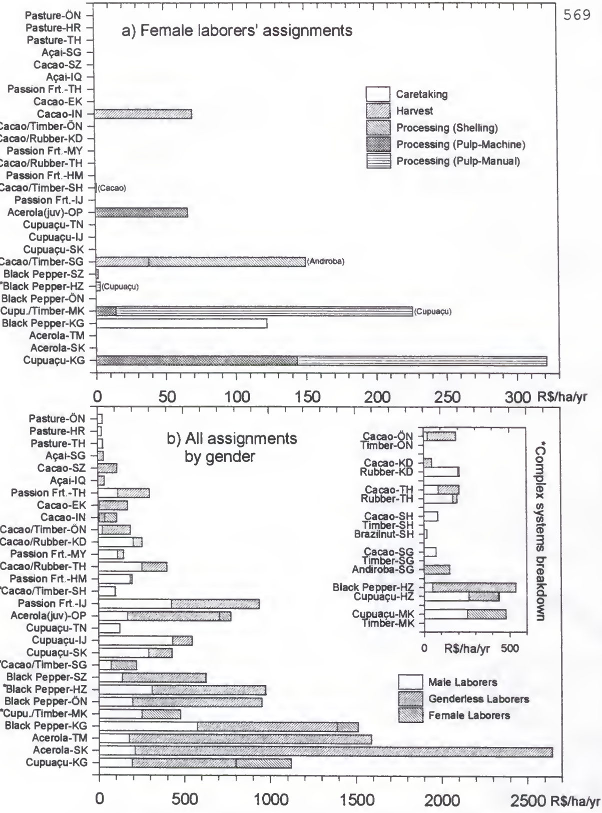


Figure 5-31. Female laborers' assignments and all assignments by gender

b; summery). Generally speaking, work using machines or tractors was assigned to men (Figures 5-28 and 5-29). Fertilizer and chemical (except insect trap) applications were men's tasks. Manual clearing/weeding and pruning/parasite cleaning were done by both genders (Figure 5-30 top), though there were preferences among owners (Figure 5-28). In Figures 5-29 and 5-30 (bottom), harvests of rubber and cacao 'including caretaking' refer to share contracts, where contractors received 50-60% of harvests in return for annual overall (minimum) care including parasite cleaning and weed clearing. Many cacao and rubber tree owners chose this as a way to reduce management risks, mostly laborer costs, when product prices were very low.

Lumped cash income opportunities for rural residents came at the time of acerola and black pepper harvests (Figure 5-30 bottom). Farm owners drove trucks to nearby hamlets to recruit pickers, who came by entire families including minors. Bulky cupuaçu and passionfruits were usually harvested by male permanent laborers (Figure 5-29) within regular hours. Konagano allowed anyone of the permanent employee families living on farm, to pick up cupuaçu by piece rate after hours (Figure 5-30 bottom). Most of the fruit/nut processing jobs were assigned to women, either using hands or machines (Figure 5-31a).

Female assignment of caretaking in Konagano's black pepper field refers to the caretaker's wife assisting her husband (Figure 5-31a). In all, crop systems revealed greater potential to generate rural employment than pasture systems (Figure 5-31b). Besides, local people consider ranches the domain of rowdies, not places where women would want to or be allowed to work (Figures 5-30 and 5-31a).

Figure 5-32 summarizes laborer income. Three pasture systems generated the least, R$ 22-29/ha with the mean of R$ 26/ha. Açai provided R$ 34/ha for Sakaguchi and R$ 37/ha for Q. Itō. Cacao paid as low as R$ 49/ha for Kondō, and as high as R$ 206/ha for Takahashi, with the mean of R$ 124/ha (s = R$ 59/ha) among 8 farms. Intercropped rubber trees provided R$ 195/ha for Takahashi and R$ 208/ha for Kondō. In the situation of low producer prices, laborers had a larger share than owners in cacao and rubber latex. Large variability was observed among other crops: passionfruit R$ 148-940/ha, cupuaçu R$ 123-1,121/ha, and black pepper R$ 636-1,512/ha. These differences among each crop were determined by wage rate, wage type (time wage or piecework), owner labor, field location, productivity, intercropping, owner attitude to crop, etc. For example, Takahashi spent double what Miyagawa spent on passionfruit, which the latter intended to be no more than a companion crop. J. Itō spent

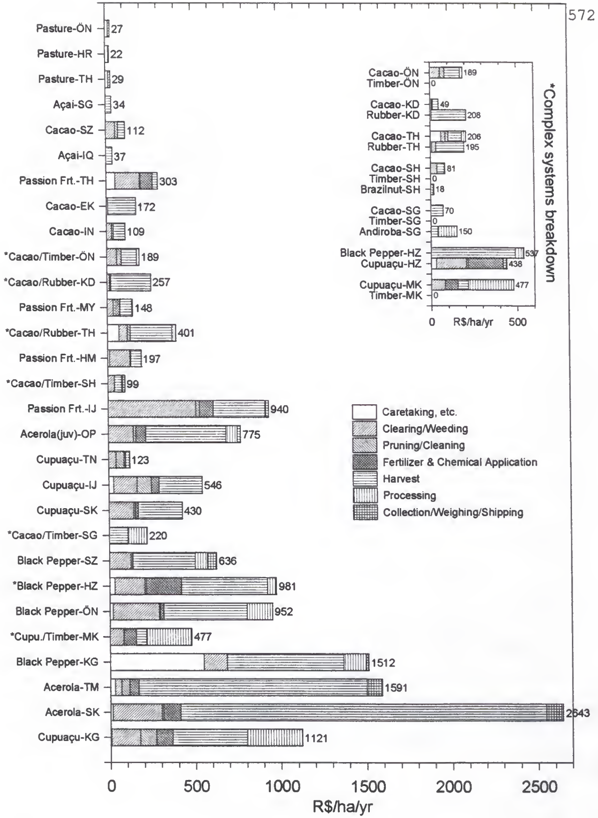
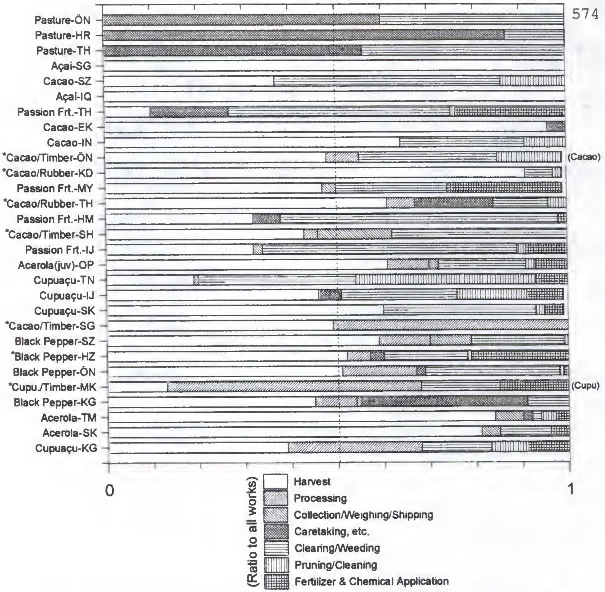


Figure 5-32. Laborer income

the most on passionfruit, and cupuaçu (with the exception of Konagano's) due to his absence from farm. Tanaka used family labor for cupuaçu, with a little help from temporary hired workers. Maki saved in cupuaçu harvest by using laborers by time wage, who worked in the field just beside the farm headquarters (i.e., with no room to goof around). Konagano paid highest in black pepper because its distant location required a caretaker. Finally, the mature acerola fields rendered highest to laborers, by R$ 1,591/ha for Takamatsu and R$ 2,643/ha for Sasaki. The difference between these two was chiefly due to compensation rates for fruit pickers.

The relative importance among income sources of each field is shown in Figure 5-33. While harvest generates the major laborer income in most crop systems, extreme cases are seen among açai, rubber tree, and acerola. Açai groves simply required no labor or other inputs to produce harvestable products. Given low market prices, rubber plantations were receiving little care but for tapping. A similar situation was observed among cacao fields of Sakaguchi and Eikawa, where harvest contractors (***empreiteiros***) were required to also perform minimal caretaking (floor clearing and parasite cleaning). Black pepper of Hiramizu was another case of the owner rationally



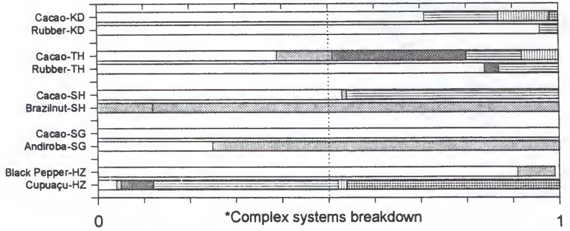


Figure 5-33. Laborer wage source ratio

deciding that no-inputs was the best course of action: that year was expected to be the last full harvest due to *Fusarium* infestation. The vines had benefitted from care to intercropped cupuaçu.

Acerola was different from these low-input crops. The high yield of small berries throughout the year, i.e. 25.6 t/ha from Sasaki, 22.2 t/ha from Takamatsu, and 7.6 t/ha from Oppata's juvenile trees, required much harvest labor. Overall the second largest source of laborer income was clearing and weeding. The highest rates were from passionfruit fields, except Miyagawa's where cupuaçu and brazilnut were grown. This is not surprising given that passionfruit fields have architecture (thin shade) and fertilizer application rates similar to those of black pepper. Also, bulky passionfruits require relatively little harvest labor compared to the very small black pepper fruits. In the cupuaçu fields of Maki and Konagano, where fruit pulp was extracted by hired female laborers, processing income was high (while most cupuaçu fruits from Tanaka, J. Itō, Sasaki, and Hiramizu were shipped to the **CAMTA** juice factory). The same was true for processing Sakaguchi's andiroba seeds for medicinal oil. Black pepper offered processing jobs chiefly to male workers in making white (unhusked) and black (dried) grains. The pastures

were quite different from the crop systems; where cowboys (caretakers) received more than half of income to labor, and contracted weeders got the rest.

Figure 5-34 shows the land area of each sample crop or pasture system that would provide the amount of labor income equal to what one full-time minimum-wage worker would earn in a year's time. Three pastures needed 54-72 ha. The eight cacao fields, producing a commodity that was bringing chronically low prices, required 4-16 ha, with the mean of 10 ha, to provide the equivalent of one person year of minimum salary work. Among them, the two rubber-intercropped fields generated more employment than the other cacao, i.e., 4 ha at Takahashi and 6 ha at Kondō for each minimum salary worker equivalent. Passionfruit ranged from 2 ha of J. Itō to 11 ha of Miyagawa, with the mean of 6 ha. Cupuaçu required 1-4 ha to offer one person year of labor income, with the exception of Tanaka's 13 ha. Acerola and black pepper provided the most labor income per land area, with an index of 1-2 ha.

Seasonality of Production and Employment

The peaks of labor demand, mostly coinciding with harvest, would determine the limit of adopting a crop system as an component of a diversified farm. Monthly sale and

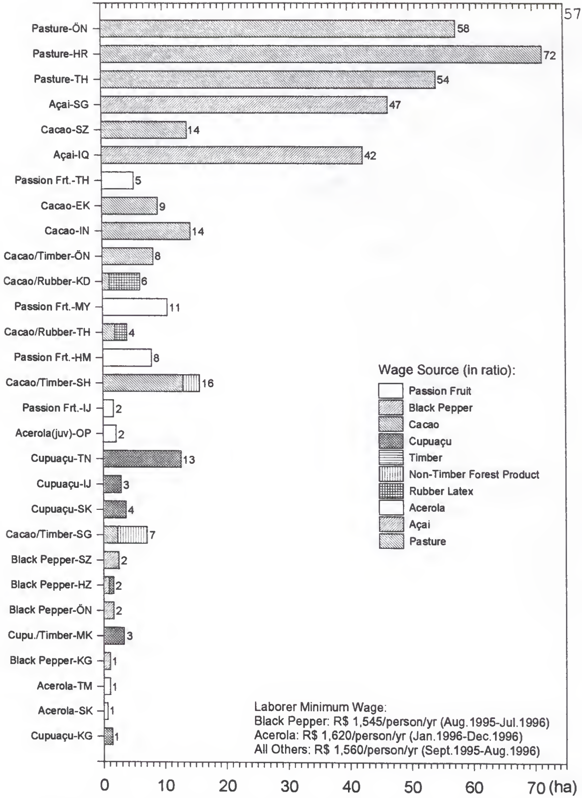


Figure 5-34. Area to provide labor income equivalent to one person year minimum wage employment

labor input (including owner) are listed in the order of pasture and açai (Figure 5-35), cacao (Figures 5-36 and 5-37), passionfruit and cupuaçu (Figure 5-38), and black pepper and acerola (Figure 5-39). For black pepper, actual monthly production of white and black grains (finished products) was multiplied by the local average producer prices of 1996. Farmers stored black pepper products in the cooperative warehouse or middlemen's storehouses, and sell as needed.

Pastures (Figure 5-35a,b) were different from other systems in that there were no clear seasonal patterns. Correlation between sale and labor demand were not observed. The owners sold cattle when they needed a lump sum of money, to the extent that the dirt roads allowed access to a ranch even in the rainy season. Producer prices were stable, being R$ 0.8/kg by live cattle weight for oxen and old bulls, and R$ 0.68-0.7/kg for old or infertile cows throughout the survey year. Besides, lacking pasture grass, Harayashiki sold 103 male calves in June 1996 for R$ 0.8/kg. When the owner called by telephone, buyers picked up cattle on site, and reported total weight to the owners. Those suffering accidental fracture or thunderbolt hit were transported to local butchers by owner or manager if time allowed (otherwise, cowboys processed meat on site for on-

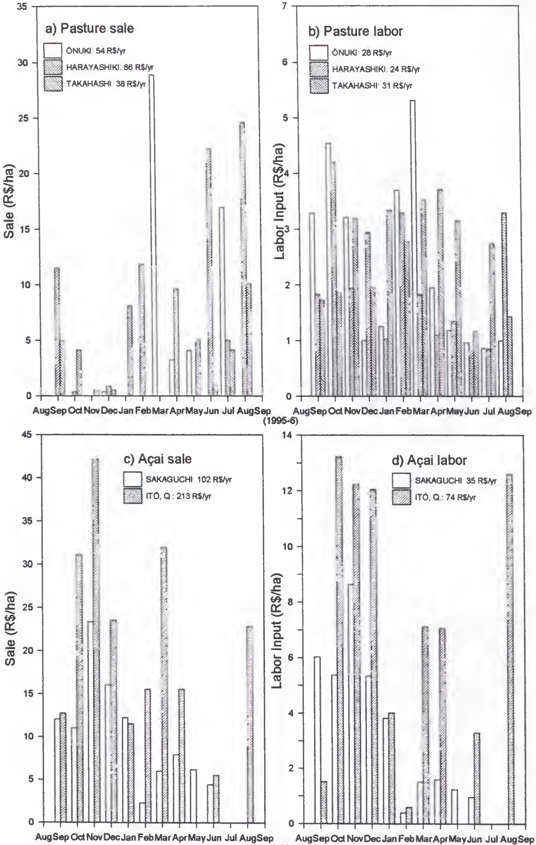


Figure 5-35. Monthly sale and labor input of pasture and açai

farm sales). Takahashi also shipped his sheep to a butcher at Quatro Bocas, for R$ 0.7-0.75/kg throughout the survey year. Daily management routines were left to cowboys (paid 2-4 times minimum salaries), whom the owners visited periodically for supervision and material supply. When necessary, weeders were contracted. Thus, except for major construction and maintenance work during the dry season, or new pasture creation at the beginning of the rainy season, there was not much seasonality of labor demand appearing in the figures of cattle ranching.

Açai groves (Figure 5-35c,d) required only harvest, that depended on pickers interested in a 50% share. Sakaguchi and Q. Itō Farms are located near town, and someone always came to ask for harvest permission in every season. Producer prices were R$ 5-12/can (***lata*** ≈ 20 liters) at the local market, and R$ 4.5/can for the ***CAMTA*** juice factory. Açai had two peaks of production, with the major one at the height of the dry season and minor one at the height of the rainy season. On Q. Itō Farm, the owner also harvested fruits himself with permanent laborers when production was not large enough to attract temporary help. On Sakaguchi Farm, young girls of the permanent laborers were given share cropping on such occasions. Initially, this author also kept records of Oppata Farm at Breu 4-6,

located far from towns and rural hamlets. There, the wife of a permanent laborer living on farm was assigned açai harvest using kids. That was suspended when she became sick. The owner was busy with other crops, and no other labor was available for açai, which was left to the local population for the taking. Açai was still generally considered to be a crop with only a small local market. However, the ***CAMTA*** juice factory was already shipping processed açai pulp to southern Brazil.

Like cacao, açai was originally a lowland (***varzea***) crop only, but had proved its adaptability to upland (***terra firme***) by voluntary establishment in local cacao plantations. Japanese-Brazilian farmers interested in palm heart thus began planting açai in their upland fields. Encouraged by this move, ***EMATER*** at Tomé-Açu adopted açai as a companion crop of cupuaçu, and extended agroforestry finance to small rural producers through ***BASA*** since 1996. As seen from Figures 5-35, 5-37, and 5-38, the major harvest of lowland açai falls between those of black pepper and cupuaçu. If this holds true on upland, it is a good sign that açai can be an important crop managed intensively for both fruits and palm heart.

Cacao (Figures 5-36 and 5-37c,d) had a clear harvest peak in May-June, with sporadic minor harvests, commonly called 'monkey crops' (***safra de macaco***). At Takahashi farm, harvest peaks were recorded at the beginning (September-October) and end (June-August) of the survey period, which suggests that he has, at least in some years, an extended harvest from June to October. Producer prices were R$ 0.8-0.95/kg of fermented dry seeds. In the rubber tree intercropped fields of Kondō and Takahashi, there was year-round production of latex, and more stable demand for labor. Middlemen visited the farms monthly and paid R$ 1/kg of solid latex. Compared to cacao, the laborers' share of latex income was higher (see Figure 5-37a,b). Kondō's cacao trees seemed to be suppressed by rubber trees, leading this author to suppose that to be the cause of overall lower owner income and labor demand. Among timber tree intercropped fields, Ōnuki had only cacao production. Sasahara had small brazilnut harvests in January and March. The nuts were shelled by a permanent laborer's boy, and shipped to Paragominas by a middleman. Sasahara received R$ 0.25/kg of nuts. Sakaguchi's cacao yield was reduced by the thick shade of andiroba, and the owner turned it over to contractors for a 50% share. All harvesting was done in one month (Figure 5-37c,d). The andiroba seed medicinal oil

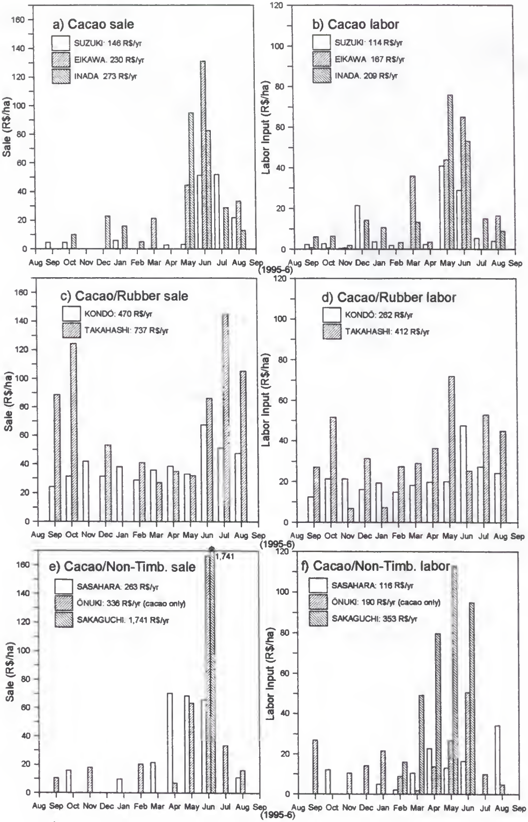


Figure 5-36. Monthly sale and labor input of cacao agroforestry

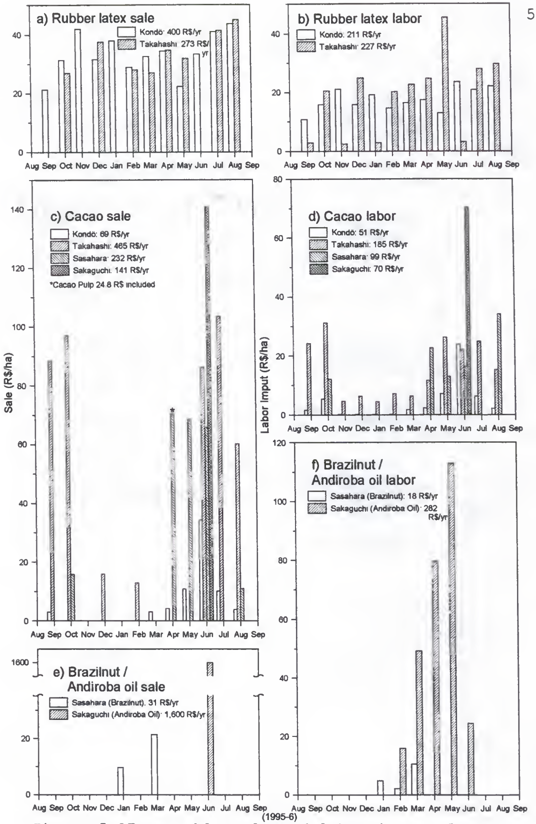


Figure 5-37. Monthly sale and labor input of cacao and non-timber products

enterprise increased overall income and employment (Figure 5-37e,f). Processing was carried out by wives of permanent laborers from February to June, with help from the owner's wife on critical tasks. The product was sold at Tomé-Açu and Belém for R$ 20/liter during the remainder of the survey period. While cacao itself was an economically less attractive crop to farmers, it still generated income with low input, while accomodating rubber and timber trees. Enterprising farmers were taking advantage of the fact that cacao fields provided an ideal environment for various timber tree saplings. For example, Takahashi assigned his cacao/rubber tree caretaker to plant mahogany there during off-harvest season. He expected that income from harvest of mahogany, grown straight in the forest-like environment, would make up for the currently unsatisfactory income of his plantation.

Passionfruit (Figure 5-38a,b) had a different production pattern at each farm, due to differences in planting period, microclimate, irrigation, soil nutrition, pollinization, etc. This crop, first introduced in the 1970s after black pepper, was undergoing technical transformation. Having learned from advanced Japanese-Brazilian producers in the ***Zona Bragantina***, farmers of Tomé-Açu were trying to control fruiting period and increase

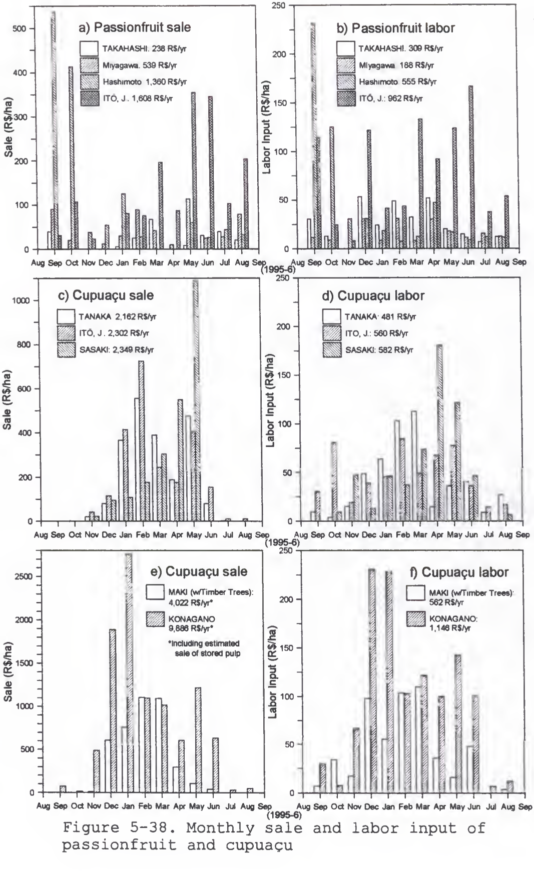


Figure 5-38. Monthly sale and labor input of passionfruit and cupuaçu

productivity in order to hit the peak of southern markets. ***CAMTA*** was distributing seedlings of 'São Paulo' variety, which bears large fruits, besides seedlings of the local 'common' (***comum***) variety, which yields high. In this way, the cooperative expected farmers to increase passionfruit supply for its juice factory, except for a short season of price hike. During September and October, prime quality passionfruits of Hashimoto and Miyagawa were shipped to São Paulo through ***CAMTA***, receiving R$ 0.4-1.4/kg. Good fruits of Hashimoto, Itō and Takahashi were sent to Recife and Brasília during the same period for R$ 0.5/kg. All the rest went to the cooperative juice factory by R$ 0.13-0.25/kg. However, there were still unsolved elements of passionfruit culture, and farmers were confused by the unpredictable fluctuations in production. Takahashi practiced traditional clean culture in a large scale, and suffered a loss when yields were quite low. ***CAMTA*** suspected a decline in the bumblebee population due to rapid deforestation around the settlement, and recommended that members practice artificial pollination. Hashimoto did this while he was able to ship fruits to São Paulo, but the ***CAMTA*** juice factory prices did not justify the cost of additional labor. While passion-fruit had not yet earned the producers' confidence as much

as the cooperative had hoped, in some cases it was a good source of employment for laborers.

Cupuaçu (Figures 5-38c,d,e,f and 5-39c,d) was a favorite crop among local farmers, yielding 4-6 t/ha with simple, routine care; Konagano produced more than 14 t/ha. Farmers received R$ 0.4-0.8/kg for fruit, or R$ 3-4/kg for extracted pulp. The latter was stocked up to the capacity of freezers at each farm, and sold when the price was favorable. Production began after the black pepper harvest, and continued throughout the rainy season. Seemingly there were two harvest peaks in January-February and May, of which the latter coincided with cacao harvest. Sasaki had only one production peak in May, and Maki had one in February-March in his timber tree intercropped field. Thanks to the large fruits (1-2 kg each) requiring little labor to collect, cupuaçu harvest did not press busy farm management in the rainy season, when all sectors demanded much weeding, clearing, parasite cleaning, planting, and fertilizer application. At Konagano Farm, the owner opted for after-hours collection with compensation by weight, that saved regular working hours for other work and provided extra income for the laborers. Some farmers were planning irrigation of cupuaçu, by which they might have year-round production with more evenly distributed labor demands.

Black pepper (Figure 5-39a,b,c,d) showed an acute harvest peak, for which seasonal laborers were called in from Cametá, Pará, in the early days. The labor demand pattern suggests that Tomé-Açu could not have accommodated many laborers year-round, until other crops, such as passionfruit and cacao, were introduced in the 1970s. The harvest season labor also includes processing, by which two kinds of products, black and white grains were made. Producer prices varied by grade and the fluctuations of the international market. This author used R$ 2.2/kg for black grains and R$ 3.53/kg for white grains in calculating estimated farmer income (the latter actually went up to R$ 6/kg in 1998). The off-season labor demand was low for occasional weeding and fertilizer application. Only Konagano had a fixed cost of caretaker due to the remote location of his field. Hiramizu (Figure 5-39c,d) abandoned his black pepper after the harvest of the survey period. He felled 100 healthy vines in November to make 4,500 cuttings for the next crop, to be planted in a new location. Other surviving vines were left for residual production of the next year. From that point on, all labor input was directed to intercropped young cupuaçu trees, that yielded the first sizable production that May. Although its lifetime had been reduced to 5-8 years by *Fusarium*, black pepper was still a

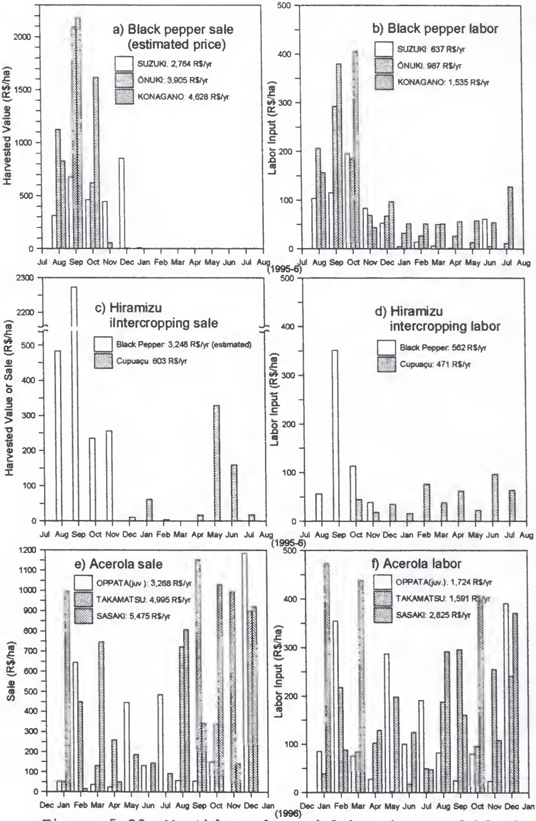


Figure 5-39. Monthly sale and labor input of black pepper and acerola

popular crop. Its cultivation techniques had already been standardized, keeping farmers busy only for several months for the harvest. Besides, abruptly soaring prices in the market, having created dozens of rich fellow immigrants, had given the 'Black Diamond' an irresistible lure.

Acerola (Figure 5-39e,f) produced plentiful berries throughout the year except a drop toward the end of the rainy season. The majority of production was shipped to the ***CAMTA*** juice factory for R$ 0.15-0.25/kg of fruits. Oppata sold a little machine-processed pulp to a visiting middleman by R$ 0.80/kg in July. The seasonal labor input pattern roughly corresponded to harvest. In the rainy season, labor demand was amplified by weeding, fertilizing, fruit fly control, and pruning/cleaning. Most acerola producers limited their operations to several hectares, due to heavy labor demand year-round. Its harvest conflicted with that of other crops, except for cacao and the second peak of cupuaçu. This induced difficulty in scheduling farm work, and recruiting labor from nearby hamlets. Distance to the ***CAMTA*** juice factory was another limiting factor, due to poor road conditions for the easily bruised berries. Even a well-off farmer equipped with large fruit processing and storage facilities had to depend upon ***CAMTA*** when production

was at a peak. Hence, as long as the cooperative finds buyers of frozen pulp in bulk, or of fresh juice in **CAMTA** brand 100ml containers, acerola can sustain producers and many rural laborers with its almost year-round income flow.

Future Scenarios for Agriculture and Land Use at Tomé-Açu

In concluding the economic survey, annual gross and net income flows of different systems are summarized in Figure 5-40. The scales are in common logarithm units, and the dotted diagonals represent contour lines of income. For example, ranching operations of several hundred to more than thousand hectares earned as much gross and net income as black pepper or cupuaçu fields of about 10 ha. This is more clearly observed in the net income data (Figure 5-40b), due to higher expenses for ranches.

Furthermore, ranchers had higher initial costs than black pepper and cupuaçu producers, as shown in Figure 5-41. Note that crop costs, including machine rental, are based on **CAMTA** (1996), and pasture costs are from the three surveyed ranchers, plus machine rental cited by Mattos and Uhl (1994). Thus, it appears that Japanese-Brazilians are not about to discard crop sectors, although their intensive

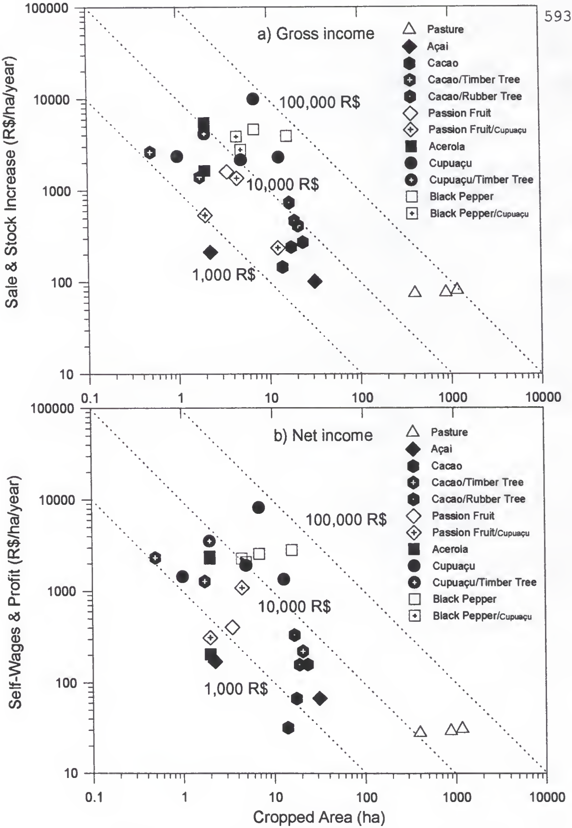


Figure 5-40. Annual income flow (1995-96)

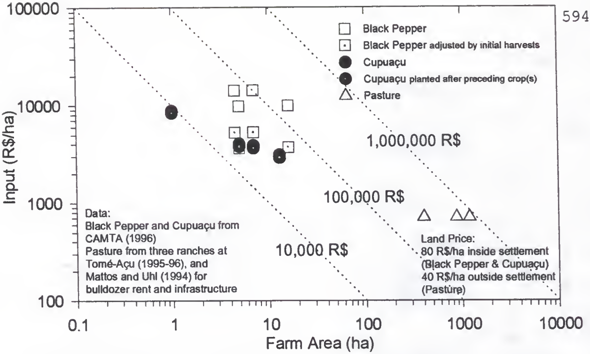


Figure 5-41. Initial three year cost of selected crops (monoculture)

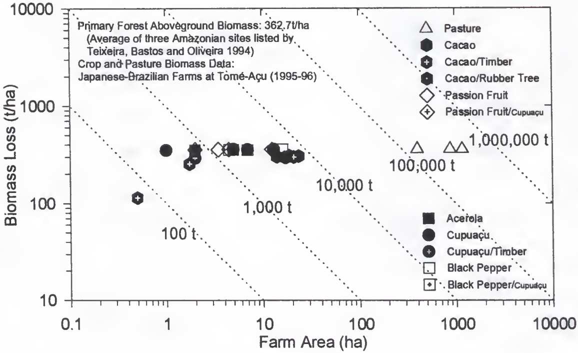


Figure 5-42. Forest biomass loss compensated by crop and pasture biomass

labor demands limit their land area scale of operations under current production systems.

If overall income from production was the goal of farm management, then timber tree agroforestry would be a sound economic alternative to ranching. Sasahara has the idea of planting 5 ha of black pepper every year for 40 years, intercropped with cacao, cupuaçu and various timber trees (Sasahara 1996). The only likely difficulty, according to Sasahara, was the financing of the initial 3 years before the first full harvest of black pepper. In the 40th year, the farm successor would start to harvest wood and begin the second cycle of agroforestry. If 5 ha of black pepper every year were too much for the resources available to Brazilian farmers, Sasahara said, even 1 ha each year would be very helpful to them. In light of the economic data on crop systems presented in this chapter, this looks like a reasonable proposal. Assuming the life time of black pepper is 5 years, 25 ha of a 200 ha (5 ha/year X 40 years) farm would demand labor-intensive care. The other 175 ha of timber trees and cacao or cupuaçu would need a much lower level of inputs. An estimated income level from each crop may be found by sliding data points of Figure 5-40 along the X-axis. Had such a hypothetical farm been in full production during the survey year, this author's data

suggests that the black pepper would have netted roughly R$ 60,000/year with the cacao/cupuaçu and timber adding another R$ 40,000/year to R$ 700,000/year. It looks likely to net a higher income than ranching.

However, in reality, there were strong incentives for ranching and disincentives for timber-tree agroforestry in the Amazon. Fearnside (1983) discussed tax exemption, low interest loans, and subsidies for pasture development. Besides, pasture establishment was the cheapest way to occupy extensive public lands (***terras devolutas***), and lands to which conflicting claims exist (Nishizawa and Koike 1992). A Tomé-Açu rancher told how his purchased land with Pará state (***ITERPA***) title was disputed by another party holding a federal (***INCRA***) title, and he won by already having pasture on the land (Sugimoto, N. 1996). Amazonian pastureland was 'one of the most profitable investments on Earth,' providing a shelter from chronic hyperinflation, and an object of speculation far beyond what might be earned by expected future production (Fearnside 1983). Hence, even small farmers in official settlements planted grass after annual cropping, and quickly sold the land for a profit. Fearnside notes (1986), 17.5% of colonist families turned over during the first 4 years (1971-74) in the Altamira

Project of Transamazon Highway. If lot abandonments and sales were to continue at this rate, about half of the original colonist families would be gone within 11 years of the project (Fearnside 1986). This mobility is the norm of the Brazilian Amazon, and new land owners are prone to radically change production strategies (Hecht and Cockburn 1989, Fearnside 1995). Thus, the long-term adoption of agroforestry still seems to be problematic (Fearnside 1995).

At Tomé-Açu and vicinity, remaining stakes of black pepper or remnants of cacao trees were common sights in the midst of pastures. It was also heard that ranchers had forced small Brazilian farmers out of their lots by intimidation, either by direct physical threats or by fire. Cacao, cupuaçu, rubber tree, and andiroba are vulnerable to fire. Once a lot is surrounded by pasture grass, it is hopeless to stay there. Burnings for land preparation or weed cleaning begin without warning the neighborers. If fire happens to destroy adjacent fields, it's seen as just an act of God. The unfortunate victims might have to move out, selling out their lots to ranchers for the price of ash. Rokusono Uwamori (1913-), a *Kōtakusei* and the president of ***CEFLAM*** (term 1993-), owned detached lots of No. 288 and No. 290 along the road ***Ramal 0*** of Daini Tomé-

Açu, sharing borders with Lot No. 289 (200 m of frontage X 1 km of depth) of a rural Brazilian farmer. In 1996, this lot became possession of a rancher in the back of Uwamori's lots, and was slashed entirely for pasture and as a corridor to the access road. Uwamori had to cut out fire breaks on both sides of the Lot No. 289, sacrificing his tree crops, and still suffered losses to fire with no compensation. In the dry season of the survey year, artificial fires claimed many fields in the settlement. The surveyed lots of Takahashi for cacao and rubber tree agroforestry could also have gone, if the caretaker had not been on hand and called for help. Takahashi sent a fire fighting team to the lots 20 km away and worked overnight to put it out. It destroyed half an adjoining cacao plantation owned by a rural Brazilian farmer. The listing of such fire losses in the settlement since the 1970s could count hundreds of thousands of planted trees, as far as this author had noticed during two years of stay at Tomé-Açu.

The major portion of land at Tomé-Açu had already been taken over by ranchers and sawmills from southern Brazil. The pastures had surrounded and sprawled into the settlement by absorbing untitled lands and lots given up by small farmers. In this light, it is hard to blame local crop farmers for their recent participation in ranching, or

pasture grass planting for better sale of land. However, this trend could cause more difficulties to their crops in the long run. The locals had already perceived rainfall reduction, that might be explained partly by the theory of Salati and Marques (1984) on continuous vapor recycling between the forests and atmosphere.

The rapid deforestation could also have caused population reduction of pollinators (Nilsson et al. 1992), and of natural enemies to pests. Above all, large scale disturbance to the tropical rain forest would destroy its efficient nutrient retention mechanisms, leaving weathered soils with inferior cation exchange capacities and poor physical characteristics (Jordan 1985). The direct implication to the future of local farmers is that they would lose extensive arable lands, and free fertilizer reserve in forest ashes. The areal scale differences between pasture and other production systems has already been discussed in this chapter. The question regarding ashes or plant nutrient reserve is illustrated in Figure 5-42. Here, the above-ground primary forest biomass is about 363 t/ha (based on Teixeira et al. 1994), and the compensational above-ground biomass at each studied field derives from Appendix K. Among all production systems without tall tree components, there were marginal

differences in per hectare standing biomass, that replaced only a very small fraction of losses from removal of the natural forest. It ranged from 2 t/ha of Ōnuki's pasture to 16 t/ha of Takamatsu's acerola. Cacao and cupuaçu under tall trees attained 60-70 t/ha, 1/6 to 1/5 of original forest biomass. Cacao and timber tree agroforestry fields of Sasahara and Sakaguchi, representing 107 t/ha (2/7 of primary forest) and 246 t/ha (2/3 of primary forest) came closest to having as much standing biomass as primary forest. Overall, there was an enormous loss in total biomass between pastures and crop systems. Besides, crop systems received fertilizers and followed courses parallel to secondary succession (Subler 1993), where biomass recovery could have been accelerated. The studied pastures did not receive fertilizer, and secondary succession was inhibited by regular weeding.

Due to complex benefits of forest to humans, it is very difficult to evaluate the social cost of forest ecosystem disturbance. The concept of fertilizer value is one that farmers can relate to, to understand what they could lose when forest is cleared for extensive pastures. Jordan (1985) figured results of three studies on nutrient stocks in the Amazonian lowland forest, where annual precipitation exceeded 2,000 mm. In the above-ground biomass, nitrogen

(N) was about 3 t/ha, phosphorus (P) was 70 kg/ha, potassium (K) was 0.6 t/ha and calcium (Ca) was 0.7 t/ha in average. With burning, nitrogen escapes as gas, while most of other minerals are supposed to become soluble ashes and remain on the ground. In 1996, fertilizer prices at ***CAMTA*** were R$ 411/t for phosphorus (P_2O_5), R$ 340.3/t for potassium (K_2O), R$ 80/t for lime ($CaCO_3$), and R$ 35-60/t for charcoal (C). This could be translated to R$ 959/t for P, R$ 411.9/t for K, R$ 200/t for Ca, and R$ 35-60/t for C. The last one, wood charcoal, is used to retain nutrients against leaching, provide a home for VA mycorrhizae, and control soil moisture and aeration (Kishimoto 1976, Sugiura and Furuya 1988, Kishimoto 1997). From the above figures, residual ash and charcoal after slash-and-burn operation would likely have fertilizer value well exceeding R$ 363/ha. Compared to this, a negligible value of ash and charcoal would be produced by burning 2-3 t of pasture grass biomass. In Figure 5-42, tonnage (t) can be replaced by Real (R$) to show a baseline value of forest biomass. For generating similar annual incomes of pastures and crop systems (Figure 5-40), there was a large gap in initial investments (Figure 5-41).

However, the gap is even wider, in the form of external diseconomies, when the forests were burned for land

preparation (Figure 5-42). Thus ranch development could prejudice local crop farmers living on subsistence and commercial cropping. In essence, these farmers are being deprived of forested lands on which more productive and sustainable farming systems could be installed, while causing much less overall forest destruction than ranching.

Despite large scale creation of pasture land, Japanese-Brazilians and other farmers actively engaged in crop culture at Tomé-Açu. The municipality was recognized as the major source of tropical fruits in the regional market of Belém. Numerous local and external middlemen were buying produce at Quatro Bocas and by going farm to farm. Besides the modernized large facility of ***CAMTA***, producers and middlemen were home-processing fruits for frozen pulp. Figure 5-43 depicts the recent increase of fruit orchards in the Japanese-Brazilian farms. Cupuaçu became popular since late 1980s in place of cacao. Simultaneously, acerola, soursop, avocado, and palms expanded in minor scales. Oil palm was once abandoned in the late 1980s, but was about to revive in 1996 thanks to the contract of ***Agropalma S.A.*** at Tailândia, Pará. Instead, historical cacao and rubber tree were generally not of interest in recent years. Quite a few farmers even forgot the ages of cacao trees from late 1970s,

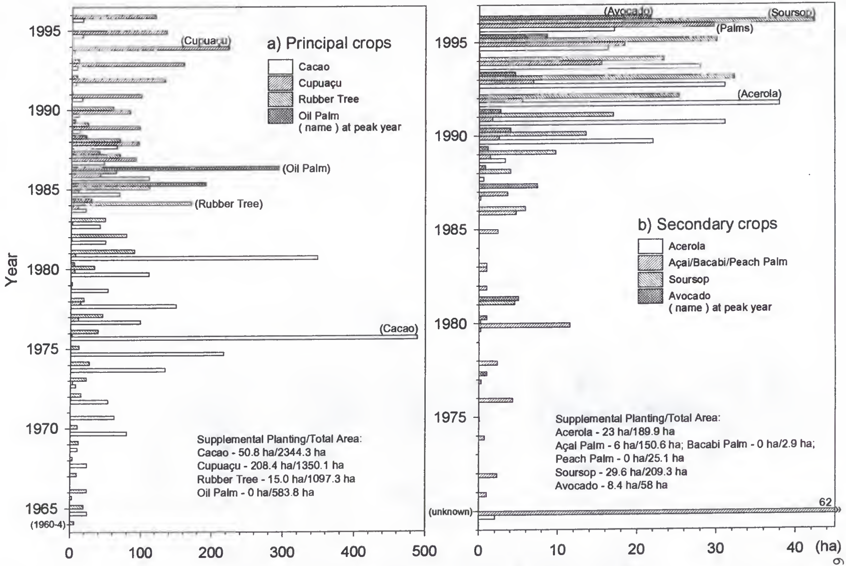


Figure 5-43. Major tree crops planted year

but said they were 'about 15 or 20 years old,' accentuating areas planted in 1976 and 1981.

Another conspicuous move of the settlement was multi-purpose tree (MPT) planting (Figure 5-44). There was a boom of freijó and andiroba in the mid 1970s. More tree species were added in recent years, and mid 1990s saw the second boom of timber trees. The detailed information of species, area, year, planted number, and planting method is provided in Appendices E through H. The initiatives of Japanese-Brazilian farmers in the ***Zona Bragantina*** (see Chapter 4) stimulated the settlement of Tomé-Açu, where 60,000 paricá and 130,000 teak seedlings were in the nursery at the end of 1996. Ranchers also showed initial interests in silvo-pastoral systems advocated by ***CEFLAM***, knowing that teak could be profitable and strong against fire and drought. In addition, ideal growth of mahogany in cacao fields during the past two decades caught farmers' attention. They started to gather seeds from mature trees in the settlement, and also purchased some from peddlers from southern Pará. Natural mahogany seedlings were transplanted into existing cacao stands in view of increasing the financial returns from those lands.

After all, however, the future of local agricultural landscape seemed beyond the control of crop farmers.

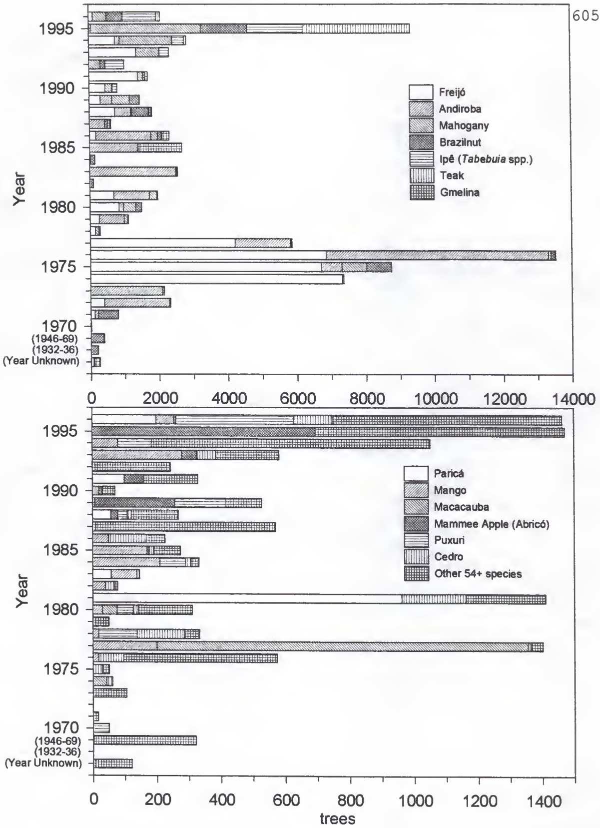


Figure 5-44. Planted year of MPTs present in 1996

Instead, it is looking like the ranching industry will have the upper hand. This might be a question intrinsically related to the interests and traditional cultural values of the Brazilian governing elites, and also, of the rural mass population (Kelsey 1940, Schurz 1961, Wagley 1963).

Portuguese first brought cattle to the dried bushy land (***sertão***) of northeastern Brazil in the 16th century. Cattle breeding fitted the nature of indigenous and mestizo cowboys (***vaqueiros***), who loved 'undisciplined life, its moments of high adventure, and its long periods of comparative idleness' (Kelsey 1940). Meanwhile in southern Brazil, mobilization of Portuguese colonist militias in anticipation of attacks by Spanish and indigenous people discouraged settled agriculture (Kelsey 1940). Thus since the 18th century, the settlers of Rio Grande do Sul turned mobile ranchers (***gaúchos***) to produce salted dry meat (***charque***), by domesticating wild cattle and horses in the natural grasslands (***pampas***). Their influential leader Getúlio D. Vargas (1883-1954) became the Brazilian president (term 1934-45 and 1951-54) who put forward national integration, especially that of the Amazon (see Chapters 2 and 3). Since the 1960s, this goal has been realized by the trio of road construction, wood extraction and pasture development (Mahar

1989, Hecht and Cockburn 1989, Hecht 1989). Today, ranchers from southern Brazil operate extensively in Pará using immigrants from northeastern Brazil as cowboys (Personal communications and observations). The rapid expansion of cattle industry all over the country put Brazil in second place in the world, behind only India, with 149,228,000 head of cattle and water buffaloes in 1996 (USDA 1998).

Through this process, rural Amazonian population (***caboclos***) and Japanese-Brazilians (***nipo-brasileiros***) have been assimilated, to share common interests and values with the Brazilian mainstream. In 1996, there was a popular TV drama series broadcasted nationwide, titled 'The King of Cattle' (***O Rei do Gado***). Every needy family living in the outskirts of towns at Tomé-Açu was watching it, paying monthly installments to hook up each hut to a large parabolic antenna. The dramatized stereotype of a rich elite (***cavaleiro***) was an influential landowner (***fazendeiro*** and ***patrão grande***) with many employees. He was an urban resident staying away from 'dirty' jobs, and playing a 'cool' Machiavellian role in high society and politics. After the decline of traditional coffee, cacao and sugarcane plantations, only ranching seemed to offer such a vision of the Brazilian dream. Compared to this ideal, even an

educated North American farmer would be less worthy of Brazilians' emulation since he operated farm machines himself (Wagley 1963).

The Japanese immigrants in the Amazon were called 'guaranteed' (***japonês garantido***) by the locals because of their reputation for good farm products and reliable negotiations (Yamane 1980). However, a middleman in Belém saw them as 'silly workers sweating in the field for months to get what he made by sitting with their products for 30 minutes in the market' (Ishibashi 1986). The general prejudice against manual labor (Wagley 1963) would tend to extinguish aspirations to make a living from a small-scale, intensive farming, while creating admiration for owners of extensive ranches or plantations. Yasui (1998) noted that *Kōtakusei* immigrants in 1930s were disappointed by the order of Brazilian social classes, having 'politicians as the top, then merchants, ranchers, farmers (to which *Kōtakusei* belonged), and fishermen.' In contrast, the traditional Japanese castes were in order: *samurai* (*shi*), farmers (*nō*), craftsmen (*kō*), merchants (*shō*), and untouchables (*hinin*).

Among ***nissei*** farmers at Tomé-Açu, there were still classical figures such as Michinori Konagano (1958-), who did not hesitate to call farming their hobby, and sweated in

the field with employees. On the other hand, (Jorge) Shigueo Takahashi (1951-) took on a more Brazilian demeanor. While knowing traditional Japanese values and having skills learned in childhood, he appeared to his employees as an authentic ***patrão***. He never touched soil in front of them, but patiently explained with words what to do and how to do it. There was another type of people who left farm work to the foreman (***capataz***) and knew little of what was going on with the crops. These loved to socialize with influential local figures, talking about the cattle business and playing cards in the daytime at Quatro Bocas. The common lesson of their parents: "crops grow hearing footsteps of the owner," seemed to be forgotten.

Hence, to promote more sustainable land use in the Amazon, an essential change of values and visions are required among national, state, and municipal leaders. They should develop policies to promote intensive mixed-crop farming and agroforestry in the Amazon, rather than extensive ranching, through tax incentives, infrastructural development including schools, cooperative promotion, and research and extension. It was already shown that intensive mixed-crop farming and agroforestry can be as profitable as ranching while causing far less disturbance to the forests. Timber tree agroforestry can restore standing biomass at the

highest rate. In this context, it is notable that ***EMATER-PA*** and ***BASA*** made funds available at Tomé-Açu in 1996 to help groups of rural Brazilian micro-producers finance cupuaçu and açai intercropping. The next institutional support to those farmers is expected to come from the Pará state government, for effective product marketing. The highest priority should go to infra-structure. After two years of observation at Tomé-Açu, this author believes that unpaved and poorly maintained road systems tend to disfavor crop farmers to a much greater extent than sawmill owners and ranchers. Poor road conditions, as already discussed, set limits on the management diversification options to cope with unstable farm product markets. Secondly, cooperatives should be fostered by tax exemptions. Otherwise, agroforestry development will face the great impediment of a money drain to middlemen (Fearnside 1995).

Being provided favorable conditions, the Japanese-Brazilian farmers at Tomé-Açu could play a more active role as regional models of crop farming, fully exercising their skills and demonstrating examples for Brazilian farmers. However, if crop farming continues to face financial difficulties and high commercial taxes, while there is little institutional advantage of cooperatives, crop farmers would be at the mercy of middlemen and remain a 'miserable'

model compared to other rural sectors. In that case, fewer Japanese-Brazilian successors would return to Tomé-Açu each year, taking urban jobs or continuing birds-of-passage lives as ***dekassegui***. Vast cattle ranches would take over the entire landscape of Tomé-Açu, as happened to numerous settlements of different national origins in southern Brazil, and all that would remain of a diverse landscape of forest and farms would be tales written of old pioneers.

Summary

Sixty seven years after the first Japanese opened the tropical rain forest, about 1,500 descendants and their family members were found at Tomé-Açu in 1996, among the total municipal population of 45,000. There were 233 Japanese-Brazilian farms holding 78,450 ha, of which 6,630 ha (8.5%) were cropped, and 20,687 ha (26.4%) were pastured. Most farms were still dependent upon the crop sector, while 83.6% of the grassland was owned by 26 large farms. A one-year economic survey revealed large differences between local crop and pasture systems regarding per hectare production. The lowest indices were returned from pastures, in which annual net income from more than 1,000 ha could be smaller than that from 10-20 ha of black pepper or cupuaçu.

There were correspondingly large differences in demand for labor, and thus ability to support a rural population. In addition, pasture development incurred external diseconomies to local agriculture by extensive deforestation. The potential losses to crop farmers included future land supply and free fertilizer from forest ashes. There were also pending questions about rainfall reduction especially in the dry season, and population reduction of pollinators and natural enemies to pests. Japanese-Brazilian and other Brazilian farmers perceived these problems were being caused by the closely related businesses of wood extraction and ranching. However, it seemed difficult to stand against them under given sociopolitical and economic conditions. Special decisions of the government leaders would be necessary to encourage intensive crop farming and agroforestry for more sustainable development of the region.

CHAPTER 6
THE LESSONS OF JAPANESE IMMIGRANT AGRICULTURE FOR SUSTAINABLE DEVELOPMENT OF THE AMAZON

The Japanese Agricultural History in Brazil and the Amazon

This study examined how Japanese immigrants developed 'sustainable' agriculture in the Brazilian Amazon. Their 90-year farming history was studied to provide lessons for long-term rural development of the region. However, it was a challenge from the outset to retrace the steps of *issei* immigrants, who were dispersed in the extensive forest land. This author tracked down obscure documents and conducted many interviews with survivors. To bring this history up to the present, and to have a solid basis for discussing the future prospects for Japanese-Brazilian agriculture in the Amazon, this author also conducted farm observations over two years and communications with ***nissei*** and ***sansei*** Japanese-Brazilians in the Amazon, for the most part at Tomé-Açu, Pará. [Chapter 1]

The Japanese immigrants in the Amazon were by no means accidental drifters across the Pacific. They were a product of political compromise between Brazil and Japan. The

latter needed a destination to send surplus population for *dekasegi*, after promising doors were closed by the US, Canada, and Australia in the early 20th century. During this period, the former at first wanted a new source of efficient coffee plantation laborers, because slavery had been abolished and European immigrants were in short supply. However, as more Japanese small farms became established in São Paulo State, the precedent of anti-Japanese immigration policies of the US began to be viewed as a model by politicians of Brazilian southern states. [Chapter 2]

Meanwhile, the Amazon went from Rubber Boom to recession due to competition from new British rubber plantations in Asia. The states of Pará and Amazonas, still lacking economic integration with Brazilian southern states, offered large land concessions to attract foreign investment. In particular, they sought rubber plantations, which US concerns might establish to challenge the British latex monopoly, and Japanese agricultural settlements something like the highly productive ones in Brazilian southern states. The Japanese embassy in Rio de Janeiro encouraged the home government and capitalists to accept these offers. In spite of the general conception of the Amazon as a 'green hell' of wild beasts and tropical diseases, the Japanese embassy made it a priority to send

immigrants to the Amazon. Thereby the embassy anticipated future Japanese business opportunities, such as trading of tropical plantation products, while not aggravating anti-Japanese sentiments in Brazilian southern states. [Chapters 2 and 3]

Since 1907, there were spontaneous Japanese immigrations to the Brazilian Amazon. Hundreds of escapees from contracted sugarcane plantations in Peru crossed over the Andes, entered Brazil by the rivers and turned rubber tappers (***seringueiros***). After the end of the Rubber Boom, they became horticulturists near Manaus, Belém and other local towns. Some facilitated the Japanese settlement projects of the 1920-30s. Thousands of people were newly called from Japan from 1928 through 1939, but most projects withered away after years of unsuccessful search for commercial crops. Tortured by poverty, tropical diseases, and other hardships, the majority of the survivors made their way to Belém and southern Brazil. [Chapter 3]

Two crops introduced from Asia by the project sponsors, and domesticated and improved by the leading immigrant farmers, saved the remaining population. The 'Oyama' variety of jute in floodplain lowland (***varzea***) at Parintins, Amazonas, and the 'Singapura' variety of black pepper in upland (***terra firme***) at Tomé-Açu, Pará, subsequently brought

major socioeconomic change to the region. Jute integrated the economies of the Amazon and southern Brazil, and black pepper broke the traditional ***aviador*** system that had inhibited sound rural development. Both were diffused among small Brazilian farmers. Brazil became one of the world's top producers of both. [see Chapter 3; and Homma et al. 1994, Homma et al. 1995, Homma 1995, 1996a, and 1996b]

The Japanese settlement projects were intended from the outset to establish stable tropical agriculture with 'permanent crops' (*einen sakumotsu*), i.e., perennial herb and tree species. On the one hand, there was insufficient cultural information on local crops, such as cacao, guaraná, and brazilnut. On the other, promising crops not yet grown in the Amazon could be obtained from the European colonies of Asia and Africa. Sponsors of the Japanese settlements in the Amazon attempted rapid collection of potential species and varieties, local and exotic, and endeavored to evaluate them using participatory trials by immigrant farmers. [Chapters 3 and 4]

Once jute and black pepper proved to be viable cash crops, most farmers abandoned other species except as homegarden plants. The jute producers spread along the Amazon River to obtain good floodplain soils and a rural Brazilian labor force. They never returned to their

original settlement at Parintins, Amazonas, which was seized and sold by the state during World War II. Meanwhile, Tomé-Açu, Pará, was designated the state Axis POW camp, where most Japanese in the Amazon, except jute producers left free by the Brazilian government, were relocated. This event revitalized the Tomé-Açu community that was about to establish black pepper culture. After the war, new immigrants from Japan were attracted to Tomé-Açu by the 'Black Diamond' black pepper until the *Fusarium* infestation of the 1960-70s. With the *Fusarium* infestation, many farmers left the settlement to find uninfected soil, while the remaining people began a cooperative initiative of crop diversification. [Chapters 3 and 4]

Passionfruit, and cacao with leguminous shade trees were planted in the fields where black pepper had once thrived. Since the 1960s, the Japanese government agencies and private companies opened experimental fields at Tomé-Açu, in collaboration with today's ***EMBRAPA-CPATU*** and promoted agroforestry development of the region. The farmers who had made spontaneous settlements in northeastern Pará and Bahia eventually adopted diversified agroforestry management. They maintained personal and organizational ties with the older farming settlements, and continued to exchange agricultural information. At each location, they

made model farms where workers from the local rural population learned improved production technology. [Chapters 3 and 4]

At the time of the *Fusarium* crisis, Pará State helped Tomé-Açu through infrastructural development. The opening of roads to Paragominas, Belém, and Marabá attracted southern Brazilian ranchers and sawmill owners to the municipality. They fenced the forest around the settlement, extracted timber, and created extensive pastures. This stimulated the younger generation of Japanese-Brazilian farmers to participate in the cattle industry. By 1996, the ranches of southern (and some northeastern) Brazilian sawmill owners and merchants had spread into the settlement by taking over untitled reservation forests and land abandoned by crop farmers. On the other hand, some resourceful Japanese-Brazilian farmers purchased lands outside of the settlement for pasture development. Rural (***caboclo***) people relocated to the town outskirts, when their lands (untitled or titled) along the streams (***igarapés***) were enclosed by the ranchers. Many were employed at sawmills. At that time, most Japanese-Brazilian farmers were still dependent upon the crop sector. However, some large farms had already accumulated cattle, while maintaining their traditional crop agriculture. [Chapters 4 and 5]

Immigrants' Struggle for Farm Development under Adverse Natural and Socioeconomic Environments

Yoshio Yamada (1898-1973), the founder of Grupo Y. Yamada in Belém, critiqued his compatriots in his book 'Thirty Years in the Amazon' (1958). He finds that the Japanese have been useful to Brazil in terms of agricultural contributions. Regardless of former occupations in Japan, all became good farmers within several years, being better-informed, better-organized, and more scientific than local farmers. For those having difficulty adapting to Brazilian language and customs, and thereby handicapped for work in urban sectors, agriculture was the blessed vocation. However, Japanese immigrants were too much preoccupied by the vanity of honored homecoming to Japan (*Kin'i Kikyō*). Only for this purpose, they led extremely frugal lives for decades and saved money. The majority of Japanese did not have ideas or dreams of a new life in Brazil, the real home of their children. Hence, they wasted much of the windfall income from the 'Black Diamond' on trips to Japan. Most of the rest they spent extravagantly on expensive homes at the settlement, parties, and gambling. They invested little of it in their farming enterprises. Then, when the black pepper market collapsed, some could not even afford to purchase fertilizer for the next crop.

However, it was not only the *dekasegi* mindset that made Japanese agriculture and life style myopic. Uchū Yasui (1917-) described his delusion in his book 'Amazon Development was Like a Dream' (1998). He had been taught at the Japan Colonization High School (*Nihon Kōtō Takushoku Gakkō*) that the Amazon was a 'treasury of natural resources' covered by millions of hectares of virgin forest. It was imagined as a mysterious land that defeated all nations that came only to exploit it, but did not love it. The goddess of the Amazon was supposed to bless those who would dedicate life for its permanent development. However, he found that most Amazon soils were unsuitable for agriculture, able to produce crops only once after slash-and-burn land clearing. Subsequent crops could be grown the next year only by applying amounts of fertilizer that cost more than the value of the harvest. He was told it would take 30 years for soil fertility to recover after field abandonment. The local forest trees had poorly developed tap roots and a thick mat of fibrous roots in the forest litter. The soil beneath was infertile. Yasui speculated that the great virgin forest was being nourished by water, air, little leaf moulds, and solar energy. Besides, there was rapid turnover; old or outcompeted trees fell loudly day and night. The lesson given at the Japan Colonization High School: "love the land,

do not exploit it, and flourish with nature to establish a new civilization," sounded empty before this great, strange forest. Yasui felt if he followed this noble philosophy that he himself could at best have survived there awhile by gathering fruits and nuts, and finally collapsed to become food for the root mat. Nevertheless, he concluded that despite all these adversities, Japanese immigrants with little capital had no choice but to farm in the rainforest. Making a living in urban society (Belém or Manaus) posed even greater obstacles.

The immigrants found themselves beset by various other 'uncertanities' of the interior: tropical diseases, insect and snake bites, accidents in tree felling, a poor road system, dangerous transportation, robbery, and murders. Many episodes were documented (Tsunoda 1966 and 1988, Daini Tomé-Açu Ijūchi Nijūnenshi Henshū Iinkai 1984, Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai 1985, Kita 1986), and heard from each survivor. From December 1933 through the first quarter of 1937, the incidence of malaria attacks at Tomé-Açu (then Acará Settlement) was 102-150% (some pacients became repeatedly ill) of 2,000-2,600 residents (Ikeda 1965). Disease claimed 197 victims during 1929-41 (Ikeda 1965). The Rockefeller Institute studied the victims' liver samples, and revealed that hemoglobinuric fever was the major cause of death (Kita 1986). This 'Hell on Earth'

situation dramatically improved from the late 1940s through the 1970s, thanks to initiatives by the US and Brazilian governments (Chapter 3). However, Mori (1993) noted that the crime rate at Tomé-Açu became intolerable by the late 1980s. A family of 10 people sold their farm and went ***dekassegui***, after their small girl was severely injured by a robbery in 1988. In 1991, ***ACTA*** organized a Crime Prevention Committee. In 1995 from February to September, while this author was staying at Tomé-Açu, assaults occurred at farms, shops, and banks day and night. A special police unit was dispatched twice from Pará State, by petition of the municipality and local associations of commerce, sawmills, and Japanese-Brazilians. A 408 man-day police search ended with the killing of a bandit chief and arrest of 80 others, to which ***ACTA*** alone contributed R$ 27,321 (US$ 30,000) plus a jeep running 13,839 km (Nippaku Mainichi Shinbun 1995a and 1995b). While numerous local people were robbed, injured and killed, there were two deaths and some injured and hospitalized among Japanese-Brazilian farmers. Bandits were also rampant in the ***Zona Bragantina***, where residents organized vigilance corps (Han-Amazônia Nippaku Kyōkai 1995). The Kamoshida Family at Una Settlement of Bahia, the pioneers of mangosteen culture in Brazil, were slaughtered in October 1995 (São Paulo Jinmon Kagaku Kenkyūjo 1996).

This author was welcomed by them in January that year. This author's residence at Tomé-Açu was attacked before dawn on March 4, 1996, but one doped intruder was arrested in the act of breaking the door and windows. Moreover, theft of harvested or unharvested fruit, farm machinery, commodities, and cash occurred daily. Vacant houses were broken into and completely dismantled. In the dry season, arsonists destroyed large areas of agroforestry fields, to the extent of tens of thousands of cacao trees at a time. One had to be either well-armed, as were ranchers, or accept such losses as operating costs. The crime situation had become a serious obstacle to organized and far-sighted farm management.

Nevertheless, some leaders patiently encouraged fellow farmers. Kōzaburō Mineshita (1939-), who was ***CAMTA***'s managing director from 1983 to 1992 and subsequently president until March 1997, wrote an article 'Amazon Preservationism and the 60th Anniversary of Japanese Immigration' (1989). According to Mineshita, the Japanese immigrants in the Amazon had been struggling against relentless regrowth of weeds and bushes. They felt ashamed of what little farm could be claimed from the tropical rain forest within short human lives. Mineshita points out to preservationists that disturbance of natural ecosystems for

agroforestry crop farms is a far cry, in terms of environmental damage, from extensive pastures, which are even burned annually and often exist merely as a way to lay claim to large land areas. Mineshita emphasizes that Japanese immigrants developed permanent farms of useful timber trees and tropical fruits, a foundation upon which to build a prosperous regional society in harmony with nature. Under Mineshita's administration, ***CAMTA*** celebrated its 60th anniversary in 1991, and published a pamphlet 'Our Historical Review and Future Goals' (1991). This ***CAMTA*** pamphlet states three cornerstones of the cooperative's mission: 1) Supply fresh and safe tropical fruit juice to consumers of the world; 2) Practice agriculture that is compatible with conservation of remaining natural ecosystems of the Amazon; 3) Maintain high ideals and seek a better life. Mineshita published another article 'A Message to ***Nisseis***' (1993), in which he called upon the younger generation to become 'educated, moral, and inventive farmers.' Mineshita was concerned about their tendency to adopt 'the indolent lifestyle of the interior.' He warned them not to overexploit the Amazon, which he saw as the planet's greatest remaining treasury of plant and animal resources. Mineshita encouraged ***nisseis*** to study hard, identify useful forest species and cultivate them for the

welfare of world population. Above all, he recommended that young people participate in cooperative endeavors and develop dynamic and prosperous agricultural communities.

Kiyomi Satō (1928-) wrote an essay 'Self-Evaluation of Japanese Agriculture in the Amazon' (1994). He reviewed 33 years of his farming, 14 years at Tomé-Açu and 19 years at Castanhal, Pará, and dismissed it as a fruitless search for fortune without a clear long-term goal. He "repeatedly jumped at crops someone else had made money on, only to see the market collapse by the time of his harvest." This statement may apply in various degrees to many immigrant farmers considering their past get-rich-quick mentality (even after discounting Satō's humility about himself). In Satō's view, such haphazard management still prevailed in the ***Zona Bragantina***, and people were in quest of alternative crops while planting black pepper in branch farms 400-500 km away from home. He felt that Japanese immigrants missed the principles of tropical agriculture. For example, they did not pay attention to the loss of organic matter caused by overzealous cultivation and weeding. They faithfully followed the proverb "a master farmer weeds before seeing weeds in the field" (*Seinō wa Kusa wo Mizushite Kusa wo Toru*) to practice clean culture. In Japan it was beneficial to raise soil temperature and accelerate decomposition of

organic matter for crops. However in the Amazon, the same management caused rapid loss of organic matter, and made black pepper vines vulnerable to *Fusarium*. Satō compared 'food and medicine' of humans to 'organic matter and chemical fertilizer' of crops; black pepper grown by 'medicines' without 'food' became weak against diseases.

If Japanese-Brazilians continued such farming, Satō warned, it would be difficult for them to acquire long-lasting happiness after all. They need to reduce unnecessary and ultimately detrimental inputs, such as excessive chemicals and weeding labor, to establish sustainable agriculture in harmony with nature. Learning from his own mistakes, Mr. Satō had made a diversified agroforestry farm of rubber trees, oil palm, black pepper, acerola, lime, sapodilla, passionfruit, melon, papaya, and bell pepper with poultry and swine for the organic fertilizer supply. Producing high-quality products from each component of the diversified farm was the next challenge to Satō. He had at last found an exciting 'objective' and 'duty' of his life in developing sustainable agriculture in the Amazon, his second and last home.

Jōichi Hayashi (1935-), who was Pan-Amazônia Japanese-Brazilian Association president from 1993 to 1997 wrote 'Concluding Remarks' (1994), 'Urgent Matter of the Japanese-

Brazilian Community' (1996a) and 'The Last Five Minutes' (1996b). He questioned the long term value of immigration if its aim was only to increase local population and supply labor. The Japanese came across the seas, struggled in unfamiliar soils in isolation, made a little fortune, and had many children. However, Hayashi noted, *isseis* might perish as mere 'breeders' if they did not leave anything of lasting cultural value to the Brazilian society. To that end, Hayashi envisioned that the local Japanese-Brazilian community could become the medium for conserving and disseminating Japanese culture. However, that community had been depleted by ***dekassegui***, due to financial difficulties of agriculture, the key industry of Japanese-Brazilians in the Amazon. Recent retrenchment policies of the Brazilian government pushed more people overseas, while rapid secondary growth reclaimed farms created by decades of sweat. This discouraged those who returned from ***dekassegui***, and undermined their long-term management stability.

Hayashi recommended agroforestry of mixed timber species, which would replace secondary succession and add value to farms even in owners' absence. He expected the timber prices to soar as the natural forests continued to shrink. Hayashi urged cooperation of the entire Japanese-Brazilian community in the Amazon for solving complex issues

of species selection, disease and pest control, etc. Hayashi encouraged the aging *isseis* to begin implementation of a 'hundred year plan' of reforestation, so that the Japanese-Brazilian community could establish a firm foundation for value added industries and contribute to the local society in the long run.

This author interviewed Hayashi about his idea of ranching as an alternative or supplement to unstable crop agriculture. He replied that only rural production systems based on agroforestry could be sustainable in the Amazon (Hayashi 1993). Amazonian upland (***terra firme***) pastures have less than 10 years of economically productive life, according to Hayashi, and they leave behind extensive barren lands. Besides, he knew only a few Japanese immigrants successful in ranching, that requires special skills in cattle trading more than in breeding (Hayashi 1993).

Recent Moves of Tomé-Açu Agriculture Found in the Case Study

Sakaguchi (1997) cited a report of the Japanese preparatory mission for the Daini Tomé-Açu project, published around 1960, stating that "Tomé-Açu would prosper with black pepper and perish with black pepper." He argued that 'Black Diamond' speculation inhibited development of diversified and stable farm management at Tomé-Açu

(Yanagihara 1994 and 1995). The late black pepper boom of 1986-88 foiled the aims of the Tomé-Açu Settlement Reconstruction 10-Year Plan of 1985-94 (see Chapter 3). The black pepper market fell from late 1988, and dived down to US$ 800/t against a break-even point of US$ 2,000/t in mid 1992, while alternative crops were not yet producing. This was pointed out as the major cause of ***dekassegui*** by Mori (1993) and Tanaka (1996). Separation of family members between farms at Tomé-Açu, schools in Belém, and factories in Japan became the norm. Sakaguchi stated that husbands lost confidence in agriculture when wives earned the equivalent of annual farm income in a month, by taking care of old people at hospitals in Japan (Yanagihara 1994).

However, according to Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai (1995a), farmers had at least learned a lesson from their past experiences. This time they had intercropped fruit trees, which later became the 'sole relief' when black pepper perished before recovering its investments. The cooperative envisioned a future in which Tomé-Açu's fruit pulp industry would prosper and ***dekassegui*** would no longer be necessary. This new enterprise struggled with initial difficulties of balancing crop production and marketing under the limitations of the small processing and storage facilities (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1993). In this

situation, middlemen prospered, either processing fruit locally or shipping them to larger factories elsewhere (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1995b, Tanaka 1996). Thus, when ***CAMTA*** finally expanded the juice factory and its storage facilities in 1995, a lack of raw materials forced the cooperative to purchase fruits from other municipalities (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1996). In 1996, the factory produced 2,000 t of juice against its 5,000 t/year of capacity. At this point, ***CAMTA*** began to seriously consider dissemination of fruit crops among Tomé-Açu small farmers outside the Japanese-Brazilian community (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1997). The ***EMATER*** agroforestry project might be helpful in increasing the local supply of fruit pulp for ***CAMTA***'s factory over the long term (Chapter 5).

Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai (1998) attributed the slower than anticipated progress of the juice project to low domestic prices of farm products, and shortage of capital. Tanaka (1996) explained that this situation was caused by: 1) lack of policy supporting agricultural cooperatives in Brazil; 2) reduction of institutional agricultural finances in recent years; 3) prohibition of credit business to multi-purpose agricultural cooperatives by law, so that ***CAMTA*** had to seek a US$ loan secured by mortgaging stored black

pepper, 4) hyper inflation during 1980s and early 90s, and 5) management failings of the cooperative. Maki (1995) noted that ***CAMTA***, in the absence of cooperative tax benefits in Brazil, competed poorly against middlemen because: 1) the cooperative paid taxes properly based on its published business report (that had to be approved by the associates at the annual general meeting); 2) the cooperative paid to run extension (***ATEA***) and educational (***CATES***) services for its members; 3) the cooperative had a policy of carefully selecting fruit to produce a higher value product, thereby requiring intensive labor of its associates while rejecting much of their fruit harvest; and 4) the coop members had to wait for partially deferred payments and dividends, but still had to buy coop shares. On the other hand, the middlemen did not pay the taxes that, legally, they were supposed to pay, paid no contributions for agricultural extension and farmer education, bought fruit with much less regard to quality, and paid cash on delivery or even offered advances. They were, however, known to sometimes bilk the producers.

CAMTA had to invest much in its fixed capital, the juice factory, during hyper inflation and drastic currency changes. Out of US$ 763,180 equivalent borrowed from the Constitutional Fund for Financing the Northern Region (***FNO***)

in 1991, the cooperative paid US$ 274,770 equivalent and still had debt of R$ 1,211,000 (≒ US$ 1,080,290) in December 1997 (Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai 1998). Meanwhile, the associates also borrowed from ***FNO*** for black pepper planting, but could not repay due to low black pepper prices in the early 1990s. For example, the agroforestry leader Tomio Sasahara borrowed US$ 12,000 equivalent in 1990, reimbursed US$ 8,000 equivalent by ***dekassegui***, and yet had US$ 18,000 equivalent of balance as of December 1995 (Sasahara 1995). At this point, in the absence of proper agricultural finance policy, Tomé-Açu tried to get rid of black pepper dependence, by seeking US$ loans using black pepper as collateral (Tanaka 1996). However, the low black pepper prices squeezed the cooperative and individual finances with rapidly increasing debts. During 1995-96 when this author was at Tomé-Açu, payments of ***CAMTA*** to producers were delayed for 10 to 30 days after fruit shipment to the juice factory. In need of cash, associates occasionally sold products to middlemen. In this difficult situation, each family sent members to Japan for repaying farm debts, while the cooperative itself did not have such an option.

Cattle ranching gaind popularity during this period, particularly among well-off farmers. They hoped this new sector add more stability to their diversified farms.

Profits from the crop sector and ***dekassegui*** remittance were invested to land purchase and pasture development. However, this author's economic survey of representative farm production systems at Tomé-Açu during 1995-96, suggests that ranching is not very profitable. Hundreds to more than a thousand hectares of pasture yielded annual gross income similar to 10-20 hectares of some crop systems. Furthermore, pasture cost more to establish and rendered lower net income per enterprise than those crop systems. Nevertheless ranching is attractive because it has low labor requirements per unit area and allows one to maintain control of a large amount of land which might one day be sold for a profit. Also, the Brazilian cultural value honors ranchers (***fazendeiros***). [Chapter 5]

In 1996, Brazilian government agencies at Tomé-Açu began promoting agroforestry among small Brazilian farmers, through financial assistance and technical training in systems developed on Japanese-Brazilian farms. This effort was intended to help establishing the tropical juice industry at Tomé-Açu. However, uncontrolled pasture expansion could undermine agroforestry development, by causing fire, climate change, tight land supply, loss of genetic resources, and loss of natural fertilizer sources. [Chapter 5]

Suggested Further Studies to Promote Sustainable Agriculture in the Amazon

During that difficult transition in agriculture, the Tomé-Açu settlement celebrated its 64th anniversary in 1995. At this occasion, Tomé-Açu Sōgō Nōgyō Kyōdō Kumiai (1995a) set forth their mission for sustainable agricultural development of the region:

> "Thus, the 64-year history of the settlement and cooperative had many complications and turbulences. Though a perfect solution may never come in the future, we must continue to cooperate, and strive for better rural life and society. Our work has received world attention as a model of 'sustainable agriculture' in the tropics. Though we initially intended merely to save fields from abandonment (after black pepper), intercropping of permanent and short-term species has evolved as a common production strategy. However, our real goal of 'sustainable agriculture' remains distant, due to crop disease problems, low productivity, and insufficient farm income. We need further work to develop truly coherent production systems, i.e. permanent crop complexes that mimic the natural ecosystem, and intensive cultivation for higher income.
>
> To this end, we should master appropriate crop selection and combinations, and proper maintenance of each crop and field as a whole. That is to say, the crops on a diversified farm or intercropped field must be selected with overall considerations of: 1) long-term marketability, 2) right crop for right land, 3) physiological compatibility and complementary relationship among crops, 4) appropriate farm operations and labor distribution, and 5) harvesting time and finance. There are also technical elements about which farmers must collect information and learn from experiences: 1) organic and chemical fertilizer application suitable for soil, 2) soil management including green mulch, drainage, and irrigation, 3) pruning adequate for crop physiology and ecology, 4) appropriate pest control, etc.

> Beyond improvement of crop technology and farm management, we still need to work together for increasing productivity and developing solid community industry. We could add value to our harvest by cooperative processing, trading, and facility utilization. Besides, we could also venture into other sectors such as aquaculture, livestock breeding, apiculture, and reforestation. If we study together, exchange information, and work in cooperation toward these goals, Tomé-Açu agriculture should grow into a regionally integrated sustainable system.
>
> "Cooperation is might" is the traditional ***CAMTA*** spirit, and that is the backbone of people who have survived difficulties of the interior for 64 years. This spirit must be handed down to new farmers, and young successors who should return to Tomé-Açu after graduation, and from temporary working in Japan. ***CAMTA*** should remain an organization that supports farmers' welfare by cooperation, and remain a pioneer of tropical agriculture in the Amazon, contributing to the development of an affluent regional society."

The above statement seemed generally true to other Japanese-Brazilian settlements in the Amazon, their farming and cooperative organizations, except for the longest history of ***CAMTA***. In this author's opinion, however, in order to establish 'sustainable agriculture,' more studies should be conducted than those listed by the cooperative leaders of Tomé-Açu. Participatory research involving researchers, extentionists, and farmers might help bring about progress in the following major areas:

> 1) Policy - The Amazon is climatically and socioeconomically different from southern Brazilian states. Sustainable rural development would require a regionally unique, coherent and lasting law system and its effective reinforcement. Land use, land tenure, institutional finance, infrastructural development, and agricultural taxation would be important foci.

2) Infrastructure - Among other policy-related issues, this is the most urgent for farmers who need to establish stable management of diversified crops and agroforestry systems. Otherwise, they will necessarily yield their properties to extensive pastures. On the other hand, road development has been implicated as the major cause of deforestation. Hence, appropriate land zoning and enforcement must accompany road system planning, if this is to be minimized.

3) Marketing - There is a large potential to market Amazonian fruits domestically and internationally. Since several years ago, consumption of açai and cupuaçu rapidly grew in southern Brazil. The US and European markets also seem promising for juices of cupuaçu, passionfruit, acerola, soursop, etc. On export, Southeast Asian experiences might provide useful lessons.

4) Enterprise - Research on the use of cooperative or company management focused on the development of community-based agroindustry is needed. The fostering of farmer enterprises is also related to the policy question (#1). Tanaka (1996) will analyze further the experiences of ***CAMTA***, in her on-going dissertation research through Hokkaidō University.

5) Breeding - Amazonian fruit and timber species require line selection and breeding, in order to be more productive and marketable. Participatory research and development projects involving on-going farmer initiatives should be more effective. Concerning fruit trees, results of research and extension work in the US, Thailand, and Malaysia might have some application in the Amazon.

6) Farm Ecology - It is useful for producers to understand the general nutrient balance of their farming systems. Other than the cases studied by Subler (1993), there are many unique agroforestry examples at Tomé-Açu, with probably the most precise on-farm information of crop age and treatments available in the region.

7) Forest Management - Farmers know the benefits of natural forests for their agriculture. In the past, those benefits had been considered as external economies. However, as forested lands are becoming

> more and more limited, adverse effects on local farming are apparent. Hence, research on the more sustainable management of both primary and secondary forests is urgently needed.

Crop farmers in the Amazon have been struggling for survival under these complex problems. Researches to help them establish a stable crop economy would promote efficient land use and reduce deforestation. However, ultimately, serious comittments of state and federal-level politicians are necessary. Those representing the general public should address overlying issues of large-scale deforestation, for which a small number of capitalists have been responsible. Besides, on consulting with recommendations of researchers, the politicians should make laws and oversee administration to support the interests of crop farmers and encourage them to develop sustainable agricultural systems.

Future Prospects for Japanese-Brazilian Agriculture in the Amazon

Through their 90-year presence in the Amazon, the Japanese-Brazilian farmers made a good name for themselves in agriculture. It was realized by the unique combination of informational and labor support from rural Brazilians, and diligence and innovation of Japanese immigrants (Yamane 1980). Besides, there were timely subsidies from Japan. It might be called a successful international development cooperation, far more effective than sending short-term JICA

experts and Japan Overseas Cooperation Volunteers (JOCV), the Japanese version of Peace Corps (Wakatsuki 1973). While immigration from Japan has ceased, some state governors recently hired local Japanese-Brazilians and assigned them to contact their fellow farmers from other states. Invitations came to the settlements of northeastern Pará, from Roraima State in 1991 (Saitō 1991a and 1991b), Tocantins State in 1995 (Kawano 1995), and Piauí State in 1996 (Kandachi 1996). It was envisioned that they would lead Brazilian farmers, enabling them to meet local demand for food and develop broadly marketable crops.

The Japanese-Brazilians may indeed play such a role in the Amazon, as long as they are determined to overcome difficulties by observing the lessons of their pioneer forefathers. This is, however, a considerable challenge due to their small population and technological isolation. In other words, they lack other local examples of diversified intensive agriculture to emulate, such as the Dutch, German, and Japanese settlements of southern Brazil. Being aware of this, some *isseis* at Tomé-Açu and ***Zona Bragantina*** sent their descendants to agricultural schools in São Paulo and Paraná. JICA, ***INATAM, CAMTA*** and other immigrant assistance institutions have organized field trips for Japanese-Brazilian farmers and their co-workers (e.g., Brasilian

researchers and extension service staff) in the Amazon, to show them pioneering farmers and farming communities in other parts of Brazil, the US, and Japan. Providing such educational opportunities is crucial for the success of the next generation of farmers, who might otherwise be easily 'acculturated' to the popular mode of extensive production strategies in today's Amazon. They could even end up renouncing cropping activities, though they might be as or more profitable than ranching. Once they have done this, it will be almost impossible to recover the agricultural heritage of their ancestors. No agricultural immigration from Japan to the Amazon occurred since 1980s.

'Green Hell' (***Inferno Verde***), a prophetic work of the Brazilian poet Alberto Rangel (1871-1945), has often been cited for the Japanese audience by Ryōji Noda (1875-1968), Tsukasa Uetsuka (1890-1978), Renkichi Hiraga (1902-85), and other influential people to convey the essence of what is now called 'sustainable development' (Noda 1929, Tsunoda 1966 and 1988, Agro Nascente 1983, Yasui 1998):

> "Hell is the Amazon... green hell of a modern explorer, or an anxious vandal, with the cherished image of his homeland lovingly guarded in the ancient soul of passion to dominate the virgin earth, which he savagely rapes. I resist the violence of the ravishers... But, lo, the green hell, if it is the Gehenna of tortures, is also the mansion of hope: I am the promised land of the strong and vigorous superior races, endowed with steadfastness, intelligence, and wealth; and, one day the definitive opus of civilization will come to settle

in my bosom, where the earliest immigrants, humble and poor pioneers of today, confusingly sketched their existence amongst blasphemies and clenched teeth. A poor Jesuit foretold, in the cold darkness of a prison, that I would be the 'delight of men, pleasure of life, and envy of the world.' Others will come, the blessed ones, to the seeded and cultivated earth, to lay the deep foundation of the cities where the provisional encampment of the settler was located. So many tears and so much suffering are the characteristics of ephemeral time, which precede victories... You cannot win me with a smile... I demand the sacrifices that the ancient gods required: blood and death. Yet the atonement leads to glorification. Shall one poet solemnize, in the splendor of perfect stanzas, the victims and the defeats; the closure of the poem will allude to my destiny, the glory of the most fecund valley - the kingdom of flowing waters, garden of orchids and palms, empire of rubber trees and giant water lilies!" [Rangel 1908; translated to English with the help of Deise Dutra, Denise Pendexter, and E. Paul Campbell]

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Inferno Verde (finale)

Inferno é o Amazonas... inferno verde de explorador moderno, vandalo inquieto, com a imagem amada das terras d'onde veio carinhosamente resguardada na alma anciada de paixão por dominar a terra virgem que barbaramente violenta. Eu resisto á violencia dos estupuradores... Mas emfim, o inferno verde, si é a gehenna de torturas, é a mansão de uma esperança: sou a terra promettida ás raças superiores, tonificadoras, vigorosas, dotadas de firmeza, intelligencia e providas de dinheiro; e que, um dia, virão assentar no meu seio a definitiva obra de civilização, que os primeiros immigrados, humildes e pobres *pionneire* do presente, esboçam confusamente entre blasphemias e ranger de dentes. Pobre jesita vaticinou-me, na escuridão fria de um ergastulo, que eu seria «delicias dos homens, regalo da vida e inveja do mundo». Outros virão, os felizes, na terra semeada e desbravada, meter o alicerce fundo da *urbs*, onde foi o abarracamento provisorio do *settler*. Tanta lagrima e tanto soffrimento são o apanagio do passageiro tempo, que antecede ás victorias... Não se me vence a sorrir... Exijo os sacrificios que os antigos deuses reclamavam: sangue e morte. A expiação vale, porém, a apotheóse. Que um Poeta solennize, no esplendor de estrophes perfeitas, as Victimas e a Derrota; o fecho do poema alludirá ao meu Destino, á gloria do VALLE FECUNDISSIMO --reino das Aguas correntes, horto das Orchideas e Palmeiras, imperio das Heveas e Uaupé assús!...

Alberto Rangel

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CHAPTER 7
SYNTHESIS AND REFLECTIONS

Introduction

Presentation of a study and analysis of immigrant Japanese and their descendants to a largely non-Japanese audience was a challenge. In an effort to maintain an unbiased viewpoint while presenting research data accurately, I chose to sequence historical facts chronologically. This chapter provides a synthesis of the results presented in the previous chapters.

The questions addressed in this research focused on the course of Japanese immigration to the Amazon, Japanese adaptation to and farm development experiences in the humid tropics, and future prospects for their agriculture (now interpreted broadly to include agroforestry). Preceding researches, mostly from the US and Brazil, concluded that Japanese-Brazilian farmers in the Amazon may well represent models for sustainable rural development in the humid tropics. However, the economic realities of the Japanese-Brazilian farming communities had not yet been documented and analyzed. My two-year field research at Tomé-Açu during

1995-96 was therefore spent investigating the agricultural practices, agroforestry development, and financing and sale (economics) of the major agricultural and tree crops.

Modern Japanese Immigrants

Modern Japanese emigration occurred out of historical necessity. After 260 years of isolation, Japan was suddenly forced to open up seaports to foreign trade under treaties of unequal taxation. This significantly disrupted the Japanese economy. A new, progressive government adopted rapid modernization policies to secure Japan's independence. The agricultural sector, in which 80 percent of Japanese were engaged, financed this national modernization process. Radical tax reform and economic policy changes impoverished many small farmers. Those farmers were nonetheless competent in traditional techniques of intensive agriculture, which had evolved during the period of Japanese isolation, and emphasized self-sufficiency on small, remote islands.

Due to these economic difficulties, Japanese farmers extended their traditional *dekasegi* (originally meaning, the performance of seasonal work away from home) to foreign lands. They were first called by Americans to Hawaii and the US West Coast, to work on sugar plantations, vegetable

truck farms, and in fruit orchards. Though Japanese hands were welcomed on these farms, the immigrants themselves were not satisfied with their subservient status. By saving small amounts of capital over time, Japanese eventually became independent horticulturists. They found that their traditional intensive agriculture, which required only small areas of land, helped them quickly establish themselves financially. These small farmers organized agricultural cooperatives, which also had roots in traditional community organizations based on mutual help. Japanese farmers soon produced a major portion of California's vegetables (from the 1910s until the Pacific War), and gradually decided to settle down there rather than return to Japan.

Japanese Immigrants to Brazil and the Amazon

For racial and political reasons, Japanese immigration, as well as immigration of other Asians, was progressively excluded from US territories. These exclusionary policies began in 1907, and were fully instituted by 1924. Japanese found Brazil to be a potential alternative destination for immigration, first called there by Brazilian coffee plantation owners in São Paulo State. The first group, the *Kasato-maru* ship immigrants, began working there in 1908. Japanese immigrants in São Paulo soon followed a similar

course to those in California. They became small, independent horticulturists, organizing themselves into agricultural coops to became major vegetable suppliers in the state. Though they dreamed of someday returning home after becoming rich, most ended up settling permanently in Brazil.

After Asian immigrants were excluded from the US, the Japanese government made emigration to Brazil a national policy. It subsidized emigrant travel to and immigrant organizations in Brazil. Promotion of emigration was done to address domestic population congestion and high levels of unemployment. Foreign exchange in the form of overseas remittances from Brazil was also expected.

However, the political influence of the US eventually reached southern Brazil. Some politicians there advocated restrictions on Japanese immigration and formulated laws, though these were never executed. While the Japanese embassy in Brazil fretted over immigration restrictions, the states of the Amazon (then Pará and Amazonas), in contrast, began offering Japanese farmers and capitalists inducements to come there: land concessions of 1 million hectares each venture company. The Amazon region was then suffering the economic depression of the 1920s, the aftermath of the rubber boom. State governors there knew the reputation of

Japanese farmers in southern Brazil, and hoped that they might revitalize their depressed regional economy.

Within the national policy context of the period, the Japanese government and capitalists found common interests. The extensive Brazilian land grants being offered seemed to present land for the excessive domestic Japanese population. For Japanese capitalists, the extensive land grants represented secure investment opportunities, backed by official bilateral agreements. Both groups hoped for expanding future business between Japan and the Amazon, as the latter already was considered a global treasury of natural resources. Thus, organized direct immigration from Japan to the Brazilian Amazon began in 1928. Immigration would continue for half a century, with an interruption during 1942-52 by World War II.

Development projects in the Amazonian interior presented initial challenges well beyond the expectations of both the Japanese venture companies and immigrants farmers sent there from all over Japan. Despite large investments in infrastructure and facilities, the Japanese lacked sufficient knowledge in agriculture and public health suitable for the tropics. This led to both crop failures and malarial infestations. At Parintins, Amazonas immigrants managed to establish jute culture in the 1930s, before conditions there worsened. However, at Tomé-Açu

(named Acará at that time), the sponsoring company withdrew its support of the immigration project before black pepper culture became profitable in the 1940s. Tomé-Açu farmers thus experienced a 'hell on earth,' becoming thoroughly impoverished, while being infected and killed by tropical diseases. Many surviving farmers escaped to the outskirts of cities, to restart their lives as horticulturists. A small number of people remained at Tomé-Açu, continuing their efforts to develop 'permanent crops,' following recommendations of the company that had founded the settlement.

There is historical irony in the fact that World War II helped Japanese farmers establish themselves in the Amazon. Jute sacking was needed by Brazil to ship latex rubber to the US and grain to the battlefields of Europe. Black pepper supplies ran short in global markets due to the Japanese occupation of Southeast Asia, and subsequent wars of independence there. Demand for these crops not only helped the Japanese immigrants, but also caused a significant change in the Amazonian regional economy. Brazil became one of the world's top five producers of both commodities. Small Brazilian farmers in lowlands (jute) and uplands (black pepper) each acquired a major cash crop for themselves. Most of these farmers had previously been

contract workers on large natural rubber and brazilnut estates, or on cacao plantations. Lucrative black pepper culture even eroded the traditional ***aviador*** system of the Brazilian Amazon. The Brazilian government, and especially President Vargas, recognized the Japanese contribution to Amazonian development, and opened the country for post-war Japanese immigration into Brazil's interior. Most post-war immigrants came to Brazil with the intention to immigrate permanently, not *dekasegi*. This new group of immigrants was expected to contribute to Brazil's rural development, and thus further national integration initiatives.

Post-War Japanese Immigrant Agriculture in the Amazon

As black pepper became the primary target crop, Japanese immigrants at Tomé-Açu concentrated their efforts on it. Other crops, except those grown in private homegardens, were generally discarded. This provided painful lessons to farmers when global commodity market fluctuations began in the late 1950s. In spite of this uncertainty, farmers still competed among themselves to yield record pepper corn harvests per vine (or stake). They had naturally adopted intensive traditional practices brought from Japan, based on labor intensive clean culture ("the master farmer weeds before seeing weeds"), and large

inputs of organic and, subsequently, chemical fertilizers. Due to the large labor required to apply organic inputs (especially difficult in a humid tropical climate), chemical fertilizers became a blessing. However, these inputs, together with the exhaustive clean culture habit of Japanese immigrants, contributed to the physical and biological degradation of both soils and black pepper plants. *Fusarium* outbreaks eventually wiped out black pepper plantations in the 1960s and 1970s.

Coincidentally, this was a time when both the Brazilian and Japanese economies expanded. Both governments strengthened their support of Japanese immigrant communities in the Amazon through research, extension, infrastructural and financial facilities. In Brazil, post-war immigrants began to supersede pre-war immigrants in positions of community leadership. The new leadership sought alternative crops and more sustainable models for tropical agriculture. Their empirical decision to opt for agroforestry was based on a combination of their traditional experience and agricultural education in Japan, in conjunction with lessons learned from rural Brazilians. They continued an adaptive trial and error approach through the 1980s and 1990s, developing numerous varieties of agroforestry systems.

However, the economic crises in Brazil during the last two decades of the 20th century have again cast a shadow over agricultural development in the Amazon. Domestic hyper inflation and unstable markets for farm products undermined successful management of agricultural cooperatives and individual farms. Infrastructural development and public services within the interior became increasingly insufficient during this period. The cooperative of Tomé-Açu (***CAMTA***) experienced a financial crisis of its own in the early 1980s, but was saved by emergency financing arranged through the Japanese government. The Japanese government subsidized road maintenance, electrification, rural telephone system development, hospital facilities, and various agricultural research and extension services for the Tomé-Açu settlement. Some of these subsidies were obtained through joint projects with Brazilian government agencies, such as Pará State and ***EMBRAPA-CPATU***.

By 1996, the Japanese-Brazilian economy at Tomé-Açu had become based on crop agriculture and diversified agroforestry systems. There were also significant remittances from Japanese-Brazilians working in Japan (***dekassegui***), to finance farm activities and the education of children. A small number of resourceful farmers has begun to accumulated grasslands suitable for ranching, and

adopted ranching practices from southern Brazilian ranchers who moved into the area in the late 1970s. Japanese-Brazilians at Tomé-Açu learned from the southern ranchers that saving wealth (from the cropping sector, ***dekassegui***, etc.) in the form of cattle was a most secure strategy in an unstable Brazilian economy. However, my financial record keeping indicated that crop agriculture and the agroforestry systems developed by Japanese-Brazilian farmers were both much more profitable and generated more rural employment than cattle ranching. Using 1995-96 income scales, yields from 10-20 ha of crop fields were comparable to the income generated from several hundred to more than a thousand hectares of pasture. Nevertheless, local expansion of pasture across the landscape was already a physical threat to the remaining islands of crop farms and agroforestry fields.

The General Applicability of the Japanese-Brazilian Experience

Some authors have argued that Japanese 'success' in the Amazon was achieved as a result to their strong education, particular determination and patience, and resources (including external subsidies). It has been concluded, therefore, that it might be difficult to apply the Japanese model to other Brazilian farmers. However, I believe that

my study has reinforced a general notion about human nature: that necessity is the mother of development. The Japanese originally developed their intensive 'traditional' agriculture due to a scarcity of land resources at home. Their forestry practices evolved when they had exhausted their natural forest resources. National isolation and the division of domains during the Edo Period forced Japanese farmers to be self-sufficient. Their agricultural orientation towards higher land productivity was reinforced under the modernizing Meiji government through farmer education and extension until World War II. The pre-war Japanese government assumed that a stable rural sector would finance and supply a labor force for the industrialization of the nation. In this context, a portion of those farmers emigrated to the Amazon.

In contrast, the Amazon remained for a long time an extensive, extractive forest. A small number of rich people dominated rubber and brazilnut extraction activities, and cacao cultivation. Natural forests provided sufficient food to rural forest dwellers, causing little fear of starvation. However, as these forest people gradually became involved in the cash economy, they found it necessary to cultivate land and earn money. They also wanted to own consumer goods, to educate their children, and to receive medical services. This was what led the rural Brazilians, even in the absence

of sufficient institutional supports, to adopt and master horticulture, jute culture, and black pepper culture as first introduced by the Japanese immigrants. At Tomé-Açu, locals also planted passionfruit, cupuaçu and açai following Japanese-Brazilian methods. Hence, if sufficient and timely institutional supports were made available, I conclude that rural Brazilians could in fact further develop a stable intensive agricultural production base.

In my observations, both the Japanese and Brazilian farmers tend to follow concrete examples, rather than abstract recommendations of researchers and extension agents. In Japan, farmers are interested to know if an 'expert' is teaching something based on mere reading or on his/her own direct experience. For rural Brazilian farmers, the presence of Japanese-Brazilians among them, providing actual examples of farming, was a good source of technical information. They learned how to plant, tend, harvest, and process crops by working on Japanese-Brazilian farms. In this regard, Japanese government support of immigrant farmers contributed indirectly, but significantly, to the rural development of the region. It also helps preserve 'core farmers' or 'master farmers' as examples in the Amazonian context.

The Japanese immigrant farmers also demonstrated for the first time the merits and weaknesses of agricultural

cooperatives in the Amazon. They showed not only how cooperatives can protect farmers' interests from exploitative middlemen, but also how the efficacy of cooperatives can decline when government policies treat commercial capital and cooperatives equally. The Japanese model has also shown how cooperative organizations can gain bargaining power in politics. Brazilian residents at Tomé-Açu still remember how Tomé-Açu Multipurpose Agricultural Cooperative (***CAMTA*** [***Cooperativa Agrícola Mista de Tomé-Açu***]) contributed to municipal incorporation and its development through the mid-1980s. In the 1990s, while ***CAMTA***, as well as other agricultural cooperatives in Brazil, has become weaker than before, the Japanese government has continued to subsidize its juice factory. This factory is expected to also benefit local Brazilian farmers, by processing their tropical fruits.

Due to the current financial difficulties of the Brazilian government and Brazil's extensive land area, I believe that international aid will continue to be necessary to establish sustainable agriculture in the Amazon. If the international community wants to slow pasture expansion and preserve remaining Amazonian forests, it should send the appropriate market signals to local Brazilians there. If tropical fruits and multipurpose trees produced under

agroforestry systems offer stable rewards, more people will become interested in Japanese-Brazilian agroforestry systems. If numerous small farmers can establish a stable mixed-crop farm economy, then they will be able to stand together in favor of sustainable land management in one region, rather than resorting to temporary cropping, pasture planting, and then cheap land sales to ranchers.

Brazilians have shown themselves to be open-minded, to the extent that they accepted Japanese at a time when the latter were excluded from other countries. I believe that they also welcome non-government and international organizations today, to undertake joint projects for sound development of the Amazon. The Japanese-Brazilian model of agroforestry will find more general applicability, once the international community decides to make a serious commitment to help rural Brazilians economically, rather than solely focus on the protection of remaining primary forests. Development planning, land use, and zoning issues should be addressed through this interaction, based on mutual understanding of each other's interests, and trust. I believe that this approach could lead as a result to more effective conservation of both agricultural land and the remaining Amazonian rain forest.

APPENDIX A

PER HECTARE ORGANIC MATTER AND CHEMICAL FERTILIZER INPUTS IN BLACK PEPPER FIELDS AT TOMÉ-AÇU, BEFORE AND AFTER THE *FUSARIUM SOLANI* INFESTATION

Year	Organic Matter (OM; t/ha) grass mulch	castor bean cake	bone meal	total	chem. ferti-lizer (t/ha)	*OM input weight %*
1961	0*1-26.6*2	5.4*3	1.8*3	7.2-33.8	0.9*3	*88.9-97.4*
1996	0*4	5.4*5	1.8*5	7.2	3.8*5	*65.5*

*1 ignoring OM contribution from weeds in a black pepper field. Farmers eradicated weeds by intensive manual labor or newly introduced herbicides. In conventional management, hoed weeds were buried in fertilizer holes. Many people practiced mulching on limited scales. For example, a farmer said that about 3 kg of cut grass and bush from adjacent secondary growth was applied to each black pepper plant twice a year, or 7.2 t of fresh matter per hectare per year, assuming 1,200 black pepper existed. If dried OM weighed 25% of fresh matter, it would become only 1.8 t/ha/yr. Other inputs included various organic wastes such as açai seeds, cacao pods, rice straws, chicken manure mixed with saw dust, etc. In addition, farmers in this period removed surface soil of roads, strip roads and ditches, and spread it over black pepper field, which should have contributed signifi-cantly to field soil fertility and organic matter content.

*2 Terada (1979): The minimum requirment of green mulch from capim Mato Grosso (*Tripsacum dachtyloides*) was estimated to be 13.3 kg/m², or 133 t/ha, which could be produced from 1.8 ha of land without fertilizer. The author mentioned four other grass species which could produce the same amount by 1.3-2.7 ha without fertilizer. This were consistent with the ***CAMTA*** farm development plan (Table 4-3) reserving 2 ha of grasslands after harvesting rice and cassava without fartilizer, for the purpose of providing with green mulch for 1 ha of black pepper field. Dried organic matter was calculated as 20% of the fresh grass weight.

*3 Tomé-Açu Sangyō Kumiai (1961): In 1961, ***CAMTA*** purchased 7,200 t of caster bean cake, 2,400 t of bone meal, and 1,134 t of chemical fertilizers. According to Tomé-Açu Kaitaku Gojusshūnen Saiten Iinkai (1985), ***CAMTA*** members had

Appendix A--continued
1,586,700 black pepper plants in 1961. Applying ***CAMTA***'s (1996) index of 1,200 black pepper per hectare (2.5 m x 2.5 m + strip roads), approximately 1,322 ha were in black pepper plantations in 1961.
*[4] ignoring OM contribution by weeds in a black pepper field. Mulching practices had almost disappered by this point, due to its heavy labor and high costs, that became unredeemable due to the shortened life of black pepper.
*[5] ***CAMTA*** production cost estimate tables (1996)

Reference:

Cooperativa Agrícola Mista de Tomé-Açu (CAMTA). 1996. Planilhas de Custo de Produção de Cupuaçu, Acerola, Graviola, Maracujá, e Pimenta-do-Reino (Production Cost Tables for Cupuaçu, Acerola, Soursop, Passion Fruit, and Black Pepper). 8p. CAMTA, Tomé-Açu, Brazil.

Terada, S. 1979. Cobertura Morta na Cultura da Pimenta-do-Reino (Mulching for Black Pepper Culture). 9p. Comunicado Técnico No. 16. EMBRAPA-CPATU, Belém, Brazil.

Tomé-Açu Kaitaku Gojusshūnen Saiten Iinkai (Committee for the 50th Anniversary of Tomé-Açu Development). 1985. Midori-no-Daichi (The Green Earth). i + 135p. Tomé-Açu Bunka Kyōkai. Tomé-Açu, Brazil.

Tomé-Açu Sangyō Kumiai (Tomé-Açu Production Union). 1961. Tomé-Açu Sangyō Kumiai Sanjūnen-shi (Thirty Year History of Tomé-Açu Production Union). iv. 86p. Tomé-Açu Sangyō Kumiai, Tomé-Açu, Brazil.

APPENDIX B
MSAO NAGAOKA'S WRITINGS

Masao Nagaoka wrote numerous essays, proposals, notes, letters, and diaries (see the list below) while being both a farmer and later an agricultural extension worker for Amazonas State. His early papers, such as number 1, 2, and 4, discussed sustainable rural development of the Amazon. They emphasized the urgent need for colonist farmers to undertake agroforestry. His documents numbered 3, 4, 6, 8, 9, 10, 11, 12, 18, 22, 23, 25, 27, 31, and 35 illustrate various types of agroforestry in different locations. However, for farmers who didn't have suitable conditions to plant tree crops, Nagaoka recommended live mulching instead (documents 4, 23, 24, 28, 31 and 32). He believed enrichment planting of natural forest could also slow the rate of deforestation, and discussed these methods in documents 7, 13, 14, 16, 17, 31 and 34. His proposals for general infrastructural development to benefit Brazilian farmers are presented in documents 11, 15, 20, 27, and 33. These are offered to promote successful livelyhoods based on agriculture, so that farmers wouldn't wind up moving to large cities to become slum (***favela***) residents. Finally,

Nagaoka wanted to promote recovery of rapidly decreasing herbivorous fish populations in the rivers, which had been an important historical source of animal protein for rural people. In documents 19, 21, 26, 30, and 33, he discusses methods to increase and diffuse spawning grounds, through the introduction of nutrient rich 'white river' water to closed lowland swamps and permanently innundated forests (***igapó***) of nutrient poor rivers.

Nagaoka's documents 15, 19 and 20 were adopted by the Brazilian Agency of Cooperation (***ABC***) in 1994, as the basis for the Varzea Project in the Madeira River Basin (Satō, S. 1998).

List of Nagaoka's Writings

Following is a chronological list of Masao Nagaoka's published works. Most of them were translated to Portuguese and submitted to the Amazonas State government.

1) Agricultural Development and Forest Conservation in the Amazon - about These Contradictory Issues (*Amazon no Nōgyō Kaihatsu to Shinrin Hogo - Sono Aihansuru Mondai ni tsuite*). 1980.

2) Agricultural Development and Forest Conservation in the State of Amazonas - Felling and Reforestation (*Amazonas Shū ni okeru Nōgyō Kaihatsu to Shinrin Hogo - Shutsuzai to Shokurin*). 1981.

3) Considering Appropriate Agricultural Methods in the Amazon Basin (*Amazon Ryūiki ni okeru Tekisei Nōhō ni kansuru Kōsatsu*). 1984. p.29-35 in Ijū Kenkyū No. 21. Kokusai Kyōryoku Jigyōdan (JICA), Tōkyō, Japan.

4) Agricultural Development and Forest Conservation in the State of Amazonas (*Amazonas-shū ni okeru Nōgyō Kaihatsu to Shinrin Hogo*). 1985 (original written in 1984). p.1-29 in Documentation No. 736. Kokusai Kyōryoku Jigyōdan, Tōkyō, Japan.

5) On the Formation Factor of the Black Soils above the Tertiary Period Layer in the Amazon (*Amazon Dai Sankisōjō-no Dojō Terra Preta no Seisei Yōin ni tsuite*). 1985 (original written in 1984). p.31-67 in Documentation No. 736. Kokusai Kyōryoku Jigyōdan, Tōkyō, Japan.

6) A Plan of a Mother Tree Farm for Pau-Rosa Scion Production (*Pau-Rosa Sashiho Saishu-yō Bojuen Kaisetsu Keikaku*). 1986. 2p.

7) A Plan of a Medium-sized Livestock Breeding Farm for Settlement Projects of the State of Amazonas (*Amazonas-shū Shokuminchi Keikaku ni Taiōsuru Chūgata Kachiku Shuchikujō Keikaku*). 1986. 3p.

8) A Plan for Production and Distribution of Brazilnut Seedlings (*Castanha Nae Seisan Haifu Keikaku*). 1988. 2p.

9) On Settlement Planning of the State of Amazonas at the New Era (*Shinjidai ni Sokuōshita Amazonas-shū no Shokuminchi Keikaku ni tsuite*). 1989. 2p.

10) On a Road Development Plan for Agricultural Products at the Municipality of Apuí (*Apuí Gunnai no Nōgyō Seisanbutsu Hanshutsuyō Dōro no Kaisetsu Keikaku ni tsuite*). 1989. 2p.

11) Open Questions about the Thermal Power Plant Using Firewood Planned at Manacapuru Town - on the Most Important Ecological Problem of Forest Regeneration (*Manacapuru-shi ni Secchisareru Yotei no Maki wo Genryō to suru Karyoku Hatsudensho ni okeru Kadai - Shizen Seitaigaku-jō Mottomo Jūdai na Shinrin no Saisei Mondai ni tuite*). 1990. 7p.

12) To Leave Forests in the Amazon - Amazon Forest Improvement Plan (*Amazon no Shinrin wo Nokosu tameni - Amazon Shinrin Kaizōron*). 1990. 7p.

13) A New Method for Developing Forest in the Amazon - Enrichment (*Amazônia Genshirin Kaihatsu no Shin Shuhou - Enriquecimento*). 1990. p.71-74 in Agro Nascente Edição 54. Agro Nascente, São Paulo, Brazil.

14) Application for Cooperation of Threshing and Drying Facilities in the Varzea Development Plan of the State of Amazonas, and Request for Dispatch of Technical Expert for Preliminary Survey (*Amazonas-shū no Varzea no Kaihatsu Keikaku ni taisuru Dakkoku, Kansō Chōsei Setsubi no Enjo Shinsei narabini Jōki Jikō no Jizen Chōsa ni kansuru Gijutsu Senmonka no Haken Yōsei no Ken ni tsuite*). 1991. 4p.

15) An Enrichment Forestry Plan for Timber Wood Species and Açai for Palm Heart Production in the Upper Solimões River (*Solimões-gawa Jōryū Chitai ni okeru Ippan Yōzaishu to Palmito Seisanyō no Açai Yashi no Enriquecimento Keishiki no Shokurin Keikaku*). 1991. 3p.

16) An Enrichment Reforestation Plan on the East Shore of Acari River, to the East of the Mouth of Juma River (*Acari-gawa Ugan - Juma Kakō Tohō - eno Enriquecimento Shokurin Keikaku*). 1991. 5p.

17) Oil Palm Cultivation Plan in the Vicinity of Castanho Town of the Municipality of Careiro (*Careiro-gun Castanho-shi wo Chūshin to Suru Dendê Yashi Saibai Keikaku*). 1991. 2p.

18) Experimental Plan of Increasing and Diffusing Natural Spawning Grounds to Restore Fish Populations of the Amazon (*Shizen Jōtai ni okeru Amazon Gyorui no Sanran Basho no Zōka, Kakusan narabini Zōshoku Shiken Keikaku*). 1991 (original written in 1981). 3p.

19) A Proposal for Assistance in Machinery and Initial Working-Capital Funds for Experimental Land Raising Work, to Establish the Basis for Lowland Agriculture in the State of Amazonas (*Amazonas-shū no Varzea Nōgyō no Kiso wo Katameru tameno Shikenteki Kasaage Kōji Jigyō ni taisuru Hitsuyō Kikai oyobi Shoki Unten Shikin no Enjo Shinsei ni tsuite*). 1991. 4p. (revised in 1993).

20) A Fish Propagation Plan for the Negro River (*Negro-gawa no Gyorui Hanshoku Kōsō*). 1992. 2p.

21) An Oil Palm Cultivation Plan for the State of Amazonas (*Amazonas-shū Dendê Yashi Saibai Kōsō*). 1992. 4p.

22) Experimental Reforestation Plan for the Shore and Shallow Waters of the Balbina Reservoir (*Balbina Jinzōkogan narabini Sentaisui Bubun eno Shokurin Shiken Keikaku*). 1992. 3p.

23) A Personal Opinion on Agricultural Practices along the Road between Novo Aripuanã Town and the Mouth of Juma River (*Novo Aripuanã-shi kara Juma-gawa Kakou ni Itaru Dōro Ensen ni Okonawareru beki Nōgyō ni tsuite no Shiken*). 1992. 6p.

24) Improvement of Slash and Burn Agriculture Practiced in the Humid Tropics - Introduction of Live Mulch (Green Manure) Plants and Its Field Testing as a Demonstration (*Nettai Kōurin Chitai de Okonawarete-iru Yakihata Nōhō no Kairyō - Chijō Hifuku Sakumotsu (Ryokuhi Sakumotsu) wo Dōnyū-shita Yakihata Nōhō no Tenji Jisshō Shiken*). 1993. 10p.

25) An Acerola Cultivation Plan for the Agricultural School of Novo Aripuanã (*Novo Aripuanã Nōgakkō no Acerola Saibai Keikaku*). 1993. 2p.

26) A Plan for Natural Propagation of Fish in the Rivers of the Amazon (*Amazon no Shizen no Gyorui no Hanshoku Kōsō*). 1993. 14p.

27) The Plan of Thermal Power Plants Using Firewood in the Amazon and the Question of Forest Regeneration (*Amazon ni okeru Maki Genryō Karyoku Hatsudensho Keikaku to Shinrin no Saisei Mondai ni tsuite*). 1993 (original written in 1990; document 11). p.29-33 in Agro Nascente Edição 65. Agro Nascente, São Paulo, Brazil.

28) Improvement of Slash and Burn Agriculture in the Humid Tropics (1), (2) (*Nettai Kōurin Chitai deno Yakihata Nōgyō no Kairyō (1), (2)*). 1993 (original written in 1993; document 24). p.77-79 in Agro

Nascente Edição 66, and p.67-70 in Agro Nascente Edição 67. Agro Nascente, São Paulo, Brazil.

29) The Most Urgent Tasks for the State of Amazonas - a Brief Summary (Amazonas Shū ni okeru Saiyūsen Jigyō - Saiyūsen Jigyō no Yōshi). 1994. 1p.

30) A Basic Experiment Plan of Fish Propagation in the Amazon - an Artificial Spawning Ground Trial - (*Amazon no Shizen Jōtai ni okeru Gyorui Hanshoku no Kisoteki Jikken - Jinkōteki Sanran Basho Settei Shiken -*). 1995. 8p.

31) No title - a plan for the Center for Ecological Research (***Centro de Pesquisas Ecológicas***) experimental field at Novo Aripuanã. 1995. 3p.

32) ZF Farm Redevelopment Experiment Plan (*ZF Nōbokujō Chitai Saikaihatsu Shiken Kōsō*). 1997. 4p.

33) A Development Plan for the Purus River Basin (*Purus-gawa Keikoku Kaihatsu Kōsō*). 1997. 10p.

34) A Budget Table for Enrichment Planting of Primary Forest in the Amazon (100 ha) (*Amazon Genshirin-nai Enriquecimento Shokurin Keikaku Shokeihi Hyō (Hyaku Hectare)*). 1997. 8p.

35) About Practical Methods of Oil Palm Cultivation in the State of Amaoznas (for Exhibition Panel) (*Amazonas-shū ni okeru Aburayashi Saishoku no Jissaiteki Hōhō ni tsuite (Tenji Panel-yō)*). 1997. 5p.

'Agricultural Development and Forest Preservation in the State of Amazonas' (Writings List #4)

This is probably the most important paper of Masao Nagaoka including the principles of his thoughts. It evolved from the preceding three writings, and provided basis for the particular discussions of his later works.

"Slash and burn is a reasonable agricultural method where residual forest areas are large in comparison to converted areas, where tropical soils harden easily, and where people don't have much capital. However, the method's productivity diminishes in the face of increasing population pressure. The Brazilian government has been pursuing a development policy for the Amazon that emphasizes reconstructing the national economy, absorbing expanding population, and increasing the domestic supply and export of food. The government has encouraged the in-migration of various types of immigrants along the Amazon's newly constructed highways, including: refugees from droughts in Brazil's Nordeste; refugees from floods in the south; growing extant populations in rural areas; small farmers looking for new agricultural land; city laborers returning to agriculture when urban jobs become scarce; ranchers wanting to expand their operations; capitalists looking for vast cheap lands as investments; and business firms seeking tax exemptions. This in-migration is frenetic when compared to the old West or the California Gold Rush in the United States.

In rural Amazonas, extant population increases have already converted the fringes of villages into glasslands and brush. For example, there are no more secondary forests available for shifting cultivation around the lakes of Janauacá and Manaquiri. In 1982, the town of Novo Aripuanã had 2,073 residents. On the town's outskirts were 300 ha of wasted grasslands (mostly black soils) and 200 ha of degraded cassava fields. Nevertheless traditional Amazonian farmers historically divided their working hours between forest extraction for sale, and shifting cultivation for personal consumption. However, immigrants coming into Rondônia arrived mostly from the south, and were specialized in slash and burn agriculture for commercial production. This form of agriculture started around Ji-Paraná, where soil was fertile and there was an extended dry season for burning. As primary forests become scarce, fires used to prepare fields and to clear pastures often spread to adjacent secondary vegetation as well as tree crops like coffee and cacao. During the dry season of 1983, about 300 ha of cacao orchards were burned in Ouro Preto d'Oeste. Such losses force farmers to open new agricultural land, while converting old fields to crops resistant to fire, particularly pasture grasses. These converted fields became small ranches, are leased for grass

production, or are sold to large ranchers. Ranchers frequently harass their neighbors, sometimes violently, to forfeit their converted lands. Hence, farmers resort to planting grass after short-term crops, then sell their lots for a good price and move on. This accelerates forest destruction.

Rondônia State formerly enjoyed the returns from its commodity transfer tax (***ICMS*** [***Imposto sobre Operações Relativas à Circulação de Mercadorias e Prestações de Serviços de Transporte Interestadual e Intermunicipal e de Comunicação***]), which increased at a faster rate than inflation thanks to the state's extracted timber and agricultural crop sectors. However, unlike Southeast Asia, farmers arrived in Rondônia's forests almost simultaneously with loggers. This allowed little time before land clearing to harvest any timber except the highest value species like mahogany, cedro, and cerejeira. Common second-class timber species became marketable only after the tardy establishment of local sawmills. Subsequent pasture development was justified as a replacement for the squandered timber income. Meanwhile, fragile tropical soils quickly showed signs of degradation. Some lands that initially sustained four cattle per hectare became scarcely able to support one cow on four hectares. Some lands became barren wastes of non-productive brush. It seems unlikely that Brazilians would choose to starve themselves, by converting precious forests into smoke and ashes for the sake of ephemeral crop and beef production. Did they ever realize that it would require 20-40 years to again produce common tree species, and hundred years for precious timber species to regrow? Intelligent people have recently started to worry about the pace of forest destruction, yet no alternatives had been proposed to stop, or even delay forest conversion.

The fertile lands of Rondônia are known nationwide, and still attract domestic immigrants. However, excluding indigenous people's reservations, soils favorable for agriculture cover only 10 percent of Rondônia, most of which is already privately owned. In September of 1983, the National Institute of Colonization and Agrarian Reform (***INCRA*** [***Instituto Nacional de Colonização e Reforma Agrária***]) registered 50,000 families, all waiting to receive allotments in Rondônia. After such registration was suspended, the National Research Institute of the Amazon (***INPA*** [***Instituto National de

Pesquisas da Amazônia]) estimated that, as of April 1984, 100,000 families were still hoping to obtain land. In that same year ***INCRA*** undertook seven colonization projects (2,530,000 ha). Less than half of this total area contained fertile soil. The size of family lots was also reduced to 50 ha (25 ha having arable soil), from the original 100 ha allotment sizes of 1967. Farmers who couldn't obtain land or who had already impoverished their lands in Rondônia, are now preparing to enter Amazonas. An underdeveloped region suitable for growing corn and beans is located along the Transamazon Highway (***BR 230***), between the Aripuanã River and the Tapajós River. If measures to improve conventional agricultural methods are not taken soon, the destruction of Rondônia's forests may be repeated in Amazonas within an even shorter period of time. The ubiquitous chain saw will hasten forest conversion. Most farmers can't conceive the future consequences of their acts of deforestation. Once they finish converting available secondary forests, they will inevitably abandon the land and move on to other plots. Furthermore, capitalist enterprizes can destroy large forested areas in a few years, with a rapaciousness that small farmers could never match. Thus, everyone tries to clear forest as fast as possible, to maximize their short-term profit.

The fertility of tropical soils is poor, compared to the substantial resevoir of nutrients within the biomass of tropical forests. Once forest cover is removed, quick decomposition of organic matter releases nutrients. These nutrients are not bound to the weathered soil with low cation-exchange capacity, but easily leached by heavy tropical rains. It is impossible to supply sufficient organic fertilizer to a large isolated field, where poultry is not economically viable. A viable alternative is to plant 'permanent' tree crops, which can form a three-storied forest that mimics the efficient nutrient cycling systems of natural forests. This approach can also conserve agricultural budget resources, which are chronically scarce in Amazonas. I (Nagaoka) presented several stages and budget tables of a mixed-planting system consisting of rice, cassava, guaraná, and rubber (figures and tables included in the original publication). This strategy reduces planting costs to just 30 percent of the cost of planting these four crops separately. A rubber plantation is derived from

this mixed-planting scenario at 1/12 of its cost if planted in monoculture. The savings result mainly from reductions in forest clearing, surveying, and weeding. Single cropping methods destroy 4 ha of forest and yield 1 ha of rubber and 1 ha of guaraná plantations. In comparison, a mixed-planting approach converts only 1 ha of forest to produce rice and cassava in the first and second year. Meanwhile, guaraná and rubber trees grow under the ideal temperature and moisture conditions afforded by their companion food crops, receiving proper shade and wind protection.

Producers who are unable to obtain financing, or who don't like tree crops, are recommended to use a fallow mulch of pueraria (*Pueraria phaseoloides*) as an alternative method. I (Nagaoka) planted pueraria in a field having a oxisol (***Latosol Amarelo***) soil, where pineapples had been harvested for five years. Three years after its introduction, pueraria killed the formidable pineapple leaves, and overwhelmed all secondary vegetation. The field was then cleared by burning in order to plant upland rice. The rice crop lodged, due to excessive nitrogen. The next year the author selected another field having the same initial conditions as described above, and intercropped corn with 3 m x 1.5 m spacing along with rice. Both crops grew successfully. Line planting of oranges and grafted rubber without burning existing pueraria was unsuccessful. Rodents and insects sustained by the protein-rich (16.8 percent of dry weight) pueraria vines attacked the young trees. Pueraria itself dies out after two months of drought, which makes it an appropriate fallow crop for areas like Rondônia and Roraima. In Manicoré and Novo Aripuanã, where some rain falls during the dry season to preserve pueraria, other even more drought sensitive leguminous vines like calopogônio (*Calopogonio mucunoides*) may be ideal. A four field rotational system, in which three fallowed fields are covered by live mulch, will be profitable for farmers. The live mulch limits land preparation work to fire line creation, and reduces stumps and wood debris over time. On the other hand, a non-creeping leguminous desmodium (*Desmodium ovalifolium*) was proven to be tolerant of shade and soil acidity by ***INPA***. Planting desmodium between rows of guaraná (*Paullinia cupana*) as a soil cover and to feed sheep may offer good potential to maintain soil fertility.

Large plantation culture of rubber and brazilnuts has been monopolized by capitalists who have connections with government officials. In contrast, small colonists have the urgent need to establish permanent crops to support themselves, but have limited financial resources. It is wasteful to make 500-1,000 ha of Brazilnut plantations by huge investment, with grubbing and grading accompanied by organic matter removal and soil compaction. Healthy brazilnut seedlings planted along with cassava grow to 2-3 m in height by the time cassava is harvested. The seedlings then compete well with invading secondary vegetation, finally becoming mature trees. Generally, financing rubber plantation culture costs a large amount, and banks choose to give loans to capitalists having sufficient mortgages. What is needed is modified, low-cost financing for small farmers who practice mixed-planting systems; e.g. financing for rubber seedlings and for mixed-planting, in combination with conventional short-term crop loan packages. Otherwise, it will be difficult to extricate shifting cultivators from the spiral of annually destroying large areas of forest through thankless hard labor, to which they see no alternative. The key to successful financial assistance programs lies in seedling production, which requires one to two years of nursery care before outplanting. A nursery must be established early enough to produce sufficient numbers of seedlings by outplanting season. Thus, financing for nurseries must be provided to farmers without delay. Commercial seedling production tends to be speculative, and too costly for farmers. However, government agencies are not able to assume seedling production costs, to provide small farmers with seedlings either free or at cost. This is because of capitalists scratching the backs of politicians, not missing an opportunity to enhance the vested interests of the latter. A position that is fair to small farmers, like the one mentioned here, won't be acceptable to the government. Therefore, interested foreign parties should make contributions to protect the Amazon, through interventions that promote more rational Brazilian domestic policies. This can hopefully be implemented through the United Nations' Food and Agriculture Organization (FAO).

Finally, the question about the role of research institutes must be addressed. Agricultural finance programs are decided based upon technical recommendations, and an agricultural calendar developed by a

national research institute that is responsible for a vast area of the country. Though these calendars, including crucial seeding schedules, don't necessarily match the varying needs of a region's many micro-regions, they are nevertheless enforced by agricultural extension and financing agents. Researchers have been directed to maximize agricultural production over an area through the application of monocultures, using all existing chemical fertilizers and agricultural chemicals. They pay little attention to a situation in which the regional population density is 0.7 person per square kilometer. Here one's income per working hour should receive particular consideration. Researchers instead use such population density to justify applying limited capital and human resources to gigantic production zones; such as promoting cacao culture in Ouro Preto d'Oeste and Ariquemes, rubber planting in Manicoré, and mechanized blazilnut plantation culture along the Manaus-Itaquatiara Road (***AM 010***), where a single lot may be 1,500 ha. All of these are 1,000-10,000 ha scale projects, in which vast primeval forests are wiped out. Researchers scientifically study each individual crop, but not the interactions between different crops, or between crops and the surrounding environment. They fail to appreciate natural mixed forest ecosystems, beyond the conclusion that they should be converted to make way for crops of interest to them. They don't properly value the buffering capacities of the forests to: promote precipitation, modify local climate, sustain various organisms including natural enemies of crop pests, and provide fire prevention for the perennial crops of interest to farmers. The cacao trees around Ouro Preto d'Oeste and Ariquemes have been severely damaged by disease outbreaks and fire. Fire destroyed rubber trees at Manicoré, and guaraná plantations at Maués. Moreover, monocultures have been found to be vulnerable to market fluctuations. Yet it is still difficult to find studies on alternative crops capable of replacing aging cacao plantations. Therefore, this lack of research should be compensated for by making careful studies of both the natural environment and crops. From this perspective, the author believes that mixed-planting and green mulching methods are two of the few options that could delay deforestation and promote reforestation. The popularization of tree crops, which have been previously monopolized by capitalists, is the way to save the Amazon. And popularization initiatives

should begin right in homegardens, with food and fodder trees."

Nagaoka also noted in this essay that:

"Our sight is limited by the trees around us, but imagine a bird's view - the vast primeval forests and lakes, tens of thousands of living species, the great rivers carving the basin, and the rains from the Atlantic Ocean feeding this entire system. Any one missing element would not allow the existence of the Amazon. Do Brazilian high-ranking politicians who promote our agricultural development really understand this? They give fish to the voters one time, but don't teach them how to fish for life. Without stability in the lives of the general public, there is no stable foundation for a nation."

He cited the words of Zhòng Guăn (?-645 B.C.), which he had learned in secondary school from the Chinese classic *Guănzĭ Quánxiūbiān*:

"If your plan is for a year, plant grains; for ten years, plant trees; for one hundred years, educate people. Grains yield once. Trees yield ten times. Educated people yield for a hundred years."

Summaries of Five Other Selected Papers

Open Questions about the Thermal Power Plant Using Firewood Planned at Manacapuru Town - on the Most Important Ecological Problem of Forest Regeneration (Writings List #11)

Objection was made to the forest management plan for power plants that would consume 380 m^3 of wood per day, to generate 12,000 kw. The official plan was based on selective cutting, leaving trees less than 30 cm diameter at breast height (DBH). This prescription would produce an estimated 156 m^3 of wood per hectare, of which 26 m^3 would

be used as premium timber and plywood. This meant that 3 ha of forest would be selectively cut each day, 1,000 ha a year, or that 28,300 ha of total forest area would be cut over 24 years (4,300 ha of this total were estimated to be required for roads and protection forests). In harvesting secondary forests beginning in the 25th year, an estimated 6 m^3/ha/yr of wood production would be available from the small trees left after the initial selective cutting. Nagaoka argued that these yield predictions are unrealistic. They do not account for mechanical damage done to small trees during felling operations, or the strangling of residual trees by lianas taking advantage of forest gaps. In contrast, Nagaoka recommended clear cutting, which would yield 400-500 m^3/ha of wood; requiring only 1 ha of forest per day, 400 ha per year, and utilizing the same overall area over a period of 50 to 60 years. In the meantime, reforestation could proceed using the giant leucaena (*Leucaena leucocephala*) cultivar, Great Hawaiian K8 (Nagaoka introduced K8 seeds from the Philippines and shared them with ***INPA***), in combination with local trees. This would generate rural employment, produce Leucaena firewood every 7-8 years, and allow timber species to grow within Leucaena stands without the necessity of pruning.

<u>To Leave Forests in the Amazon - Amazon Forest Improvement Plan</u> (Writings List #12)

An enterprise should be planned based on sufficient scientific data. However, it requires at least 15 to 20 years, and ideally 40 to 50 years to get unambiguous results from any reforestation experiment. Amazon forests will not survive that long. Primary forests that produce only four marketable woods per hectare are valueless to farmers, except as a source of ash to sustain cassava and other crops. There is an urgent need to establish economically viable methods, by which farmers can conserve and create forests as to sustain themselves in a fixed location. International support is anticipated for reforestation trials at old mine sites, the planting of fuelwood forests for power plants, enrichment planting, and agroforestry. Unfortunately, local bureaucracies make project management inefficient. As an example, reforestation laws have required loggers to plant 37,000,000 seedlings during 1967 to 1990 period, according to the records of Brazilian Institute of Forestry Development (***IBDF***) and its successor Brazilian Institute of the Environment and Renewable Resources (***IBAMA***). If planting distance had been 8 m x 8 m (156 trees/ha), then 240,000 ha should have been reforested by now. But such new forests are nowhere to be found. The Foundation for Advanced Studies in the Humid Tropics

(***UNITROP***) was established to correct this situation, by creating an effective bridge between international project donors and farmers in the field.

A New Method for Developing Forest in the Amazon - Enrichment (Writings List #13)

In order to halt the loss of forested lands, forests should become farmers' fields. The rationale is to create production and empoloyment from forest resources, to absorb the expanding human population. The first strategy is to enrich primary forests by planting valuable species and girdling competing, less valuable ones. Nagaoka summarized his criteria for forest selection, operations protocols, and the expected results. After 15 to 20 years, he expected that up to 50 matured original trees could be felled per hectare. Planted trees would grow sufficiently for sale after 20 to 40 years if they were plywood species, and after more than 50 years if they were premium tropical woods. A total of 100 to 200 planted trees per hectare could be harvested over time. Some shade-tolerant species are vulnerable to wood-boring beetles and diseases that occur in plantations under full sun. Such species, like cedro (*Cedrela odorata*), aguano (*Swietenia macrophylla*), and pau-rosa (*Aniba rosaeodora*) would be expected to grow well as enrichment plantings beneath the forest canopy. The second strategy is to create economically valuable secondary

forests on cleared lands. Farmers from Colônia Esperança at Novo Aripuanã understood the need to plant trees after observing six years of deforestation, and began to request tree seedlings.

Application for Cooperation of Threshing and Drying Facilities in the Varzea Development Plan of the State of Amazonas, and Request for Dispatch of Technical Expert for Preliminary Survey (Writings List #14)

Jute (*Corchorus capsularis*), developed by Ryōta Oyama in 1934, was the most important cash crop in floodplain (***varzea***) areas of the Amazonas by the end of the 1980s. Jute culture helped farmers open fields which were later used for other annual crops or for grazing cattle. Cacao (*Theobroma cacao*) and rubber trees (*Hevea brasiliensis*) could also be planted on natural levees (***restinga alta***). In 1991, the state government suspended jute seed distribution due to a flat fiber market. In the Madeira Basin, watermelon had been a second crop since farmers couldn't plant grains there. This was because harvests occur during the rainy season when natural drying is impossible. Now with jute culture stopped, mechanical threshing and drying facilities become crucial to farmers, enabling them to plant rice, corn, and beans instead. However, Nagaoka recommended judicious adoption of machinery for land preparation in floodplain lowlands, due to their sensitive soil charactistics. Small, Japanese-type machines might be

preferable to the larger and heavier local machines. Land leveling can hopefully be done without machines, by introducing muddy water through an artificially opened weir on a natural levee. This will deposit sediment on plots over several years. The shallow water can, in the meantime, provide spawning areas for fish.

Experimental Reforestation Plan for the Shore and Shallow Waters of the Balbina Reservoir (Writings List #22)

The Balbina Reservoir submerged a vast upland (***terra-firme***) tropical forest, which was harshly criticized by conservationists. This area previously didn't have inundated (***igapó*** and ***varzea***) forests. Now the reservoir's extensive shoreline experiences seasonal changes of water level. Such conditions will not permit woody perennial vegetation to reestablish itself, due to lack of natural seed sources. There are three possible means to reforest this seasonally flooded environment: 1) planting light plywood species; 2) planting palms for palmito production; and 3) planting trees that provide food (fruits, seeds and insects) and spawning habitat for fish. Nagaoka mentions potential reforestation species by their local names, and proposes to clear trees killed by the dam construction to make way for a reforestation experiment on the inundated forest land. If this trial meets with success, new lowland forests and increased fish populations in the reservoir will

generate local industry for rural people, who can also take advantage of facilitated water transportation via the reservoir.

Reference:

Satō, S. 1998. Interviews. 1998/05/13-15.

See above List of Nagaoka's Writings for other reference materials.

APPENDIX C
JAPANESE-BRAZILIAN FAMILIES, BY DISTRICT, AND THEIR LAND USE AT TOMÉ-AÇU (1996)

Note: Family names are spelled by Japanese 'Rōma-Ji' (Hepburn System) with '¯' marks showing long vowels. An absent family is indicated by '▲,' and ***CAMTA*** member by '*.' Names in capitalized letters refer to organizations.

The key for table column headings follows: M = Male Family Member, and F = Female Family Member; +1 to the right of a family name indicates a person of unknown gender; All land areas are indicated in hectares (ha); Land = total property area; VF = intact primary forest; DF = primary forest extracted for domestic use; CEF = commercially extracted forest; SF = secondary forest; FL = fallow field; CR = cropped field excluding pasture; PT = pasture; and CT = number of cattle.

Family Name	M	F	Land	VF	DF	CEF	SF	FL	CR	PT	CT
<Tomé-Açu>											
Endō, D.	2	1	-								
Endō, J.	1	2	-								
Endō, M.	3	3	-								
Endō, R.	7	8	-								
Fukushima, H.	3	2	-								
Fukushima, I.	8	7	5.5						5.5		
Fukushima, R.	2	1	-								
Fukushima, S.	3	4	-								
Hidaka, C.	4	2	-								
Hidaka, J.	4	5	-								
Hidaka, P.	2	1	-								
Kamada, C.M.	2	1	-								
Kamada, T.	3	2	0.2						0.2		
Kamada Melo	8	9	77			55	6		16		
Konagano	1	2	see Breu 3-7 Konagano								
Kon Fagundes	2	3	188	75			83		10	20	
Kubo	1	4	120.1			75	35.5		9.6		
Nagata, I.	5	7	-								
Nagata, A.M.	3	5	-								
Nagata, T.	3	1	-								
Naruse	1	1	75.3		35		35		5.3		
Ōnuma Gomes	7	4	302.2			14	181.8	0.8	45.9	59.7	50
Sakaguchi*	4	8	621.5	135	167.4		214.3	1	93.8	10	
Seguchi Chaves	3	3	1000			500	180		20	300	300
Seki	7	6	-								
Shibata	1	1	1.2						1.2		
Suruki	6	1	-								
Wada +1	2	6	107.1			4	68.6		34.5		
Watanabe	4	1	25			12.5	12.5				
Yariwake	3	4	-								
Yariwake daSilva	2	2	-								
Total +1	107	107	2523.1	210	202.4	660.5	816.7	1.8	242	389.7	350

Appendix C -- continued

Family Name	M	F	Land	VF	DF	CEF	SF	FL	CR	PT	CT
<Boa Vista>											
Furumoto*	4	1	20.3				6.7	5.3	8.3		
Hanawa*	4	3	130.5	12		18	84.5		16		
Hoshino	3	2	27.5				16.5		11		
Katō, K*	6	5	383.5	75		125	130		53.5		
Katō, L.K.	1	1	296.6			50.6			9	237	30
Nishio	3	1	99.5			50	21	5	23.5		
Nobayashi Barrocal	2	1	-								
Ogushi	4	4	53.5		24.5		14.9	2	12.1		
Okabe*	1	1	96.3	25			66		5.3		
Satō	2	4	818			492	104		42	180	100
Seki	3	3	125	25		3	66.9		25.1	5	
Takenaka*	1	0	10.3				5.8		4.5		
Taketa*	4	9	517.3			193.1	242.2		82		
Yanagibashi,D.T.	4	3	119.1				10.9		9	99.2	71
Yanagibashi, T.	2	4	57				24.8	3	29.2		
Yokokura*	1	0	10.8					1	9.8		
Yokoyama*	1	1	89.3			5	76.6		7.7		
Total	46	43	2854.5	137	24.5	936.7	870.8	16.3	348	521.2	201
<Ipitinga>											
Itō*	5	1	83.4			3	67.9		7	5.5	
▲Kikuchi	3	3	30.8				17.8		12.5	0.5	
▲Murakami	1	2	60.1			40	20.1				
Ohashi*	5	5	217.1	145.1		10	43.3		18.7		
Seki, H.*	2	1	58.3	5			32.3		11	10	
Seki, J.*	3	6	64.4		3		40.4		21		
Shinomiya	2	2	87.6			16.7	14.4		56.5		
Tanaka*	1	3	62.3			3	24.8		34.5		
Total	22	23	664	150.1	3	72.7	261	0	161.2	16	0
<Arraia>											
Hanawa*	1	5	342.8			181.8	73.3	3.5	84.2		
Hayashi	4	5	216		40		14.5		1.5	160	115
Hosokawa	1	1	11				10		1		
HOSP. AMAZ. de Q.B.			169.8			163.5		0.8	5.5		
Kondō*	4	6	96				52	2.5	41.5		
Matsuyama*	4	5	0.3						0.3		
Nakagawa*	3	6	48.1				39.5		8.6		
Ohashi	1	0	-								
Oshikiri	2	3	172.4		65		55.6		51.8		
Sawada, Ta.	2	3	120.2			36	50	2.2	12	20	
Sawada, Te.	3	4	123	10	34		51	8	20		
Yamaki*	1	1	89			12	49.5		27.5		
Yokoyama	4	3	297	70	26.5	4	186.2		10.3		
Total	30	42	1685.6	80	165.5	397.3	581.6	17	264.2	180	115
<Mariquita>											
AGROPEC. ARUMÃO*			1203	18		1019	28.5	8	129.5		
Ebata	2	2	40	8		5.2	16.8		10		
Endō	3	2	29				21.7	3	4.3		
▲Hirakawa	2	1	70				40.5	19.5	10		
Ishikawa*	3	1	80				66.3		13.7		
▲Kon	2	2	152.5			60	78.7		5.8	8	
Kusano	4	4	45			20	12.3		12.7		
Matsuzaki*	5	2	15				13.5		1.5		
Obara	3	3	616.8		6.4	200	43.4	50	47	270	110
Shibata*	2	3	270			185	44.9		40.1		
Suzuki*	2	4	600			183	204.7	15	85.9	111.4	
T.A. COUNTRY CLUB			25				5		20		
Takada*	5	1	75		25		34.3		15.7		
Takamatsu*	6	2	216.6			35.5	103.1		74.5	3.5	
Watanabe	1	1	50				37.3	5	7.7		
▲Yoshioka	1	4	24.5			15	9.5				
Total	41	32	3512.4	26	31.4	1722.7	760.5	100.5	478.4	392.9	110

Appendix C -- continued

Family Name	M	F	Land	VF	DF	CEF	SF	FL	CR	PT	CT
<Quatro Bocas>											
Abe	2	2	-								
ASFATA			1790.2	373	10	1082.5	250	24.5	30.2	20	
Endō	1	3	-								
▲Endō Sampaio	1	1	-								
Fujihashi	2	2	1700			1340	150	7.5	2.5	200	220
Gotō, T.	3	2	1072.1			560.7	25		1.1	486.3	400
Gotō, Y.	3	2	2075.2	200		725	10		15.2	1125	1050
Hantani	2	5	151.2			16.8	100.8		33.6		
Hamaguchi	1	2	-								
Hayashi	2	4	-								
Hidaka	3	2	-								
Hidaka Boulhosa	3	3	-								
Inomata*	2	2	24.9				20.1		4.8		
Ishikawa	2	1	600	250		200		30		120	60
Isogai	3	2	-								
Izumi Lima	1	5	-								
Kanekiyo	2	2	-								
Kasamatsu*	4	6	50.1				37.1		6	7	2
Katō	3	5	200	29		60	61.5		49.5		
Kawagoe	1	2	-								
Kawakami	2	5	28.6	6			12.6	2	8		
Kudō	1	1	-								
▲Kuroki,O.*	3	1	31.4			7	11.9		12.5		
Kuroki, S.S.	2	1	-								
Kuroki Gonçalves	1	1	-								
Matsumoto	5	4	-								
Matsuzaki	3	1	760.2			457.5	115.5		67.2	120	100
Miyake*	2	2	59.3				54	2.5	2.8		
Moritsuka	2	3	260.1			70	90.5	20	4.6	75	110
Morotomi	4	6	257.6			219.5	17.4		5.7	15	
Murakami	4	4	-								
Muroi	4	1	95			51	13		29	2	
Nagai, A.	1	2	17.7			3	11		3.7		
Nagai, H.	1	3	see Breu 5-8 Nagai, T.								
Nagai, K.	2	4	-								
Nobayashi Barrocal	1	3	-								
Noguchi	4	1	573.3			256.3	33.7	17	23	243.3	160
Ogushi, C.	2	2	-								
Ogushi, T.	3	3	125.6	12	69.5		30.6		12.5	1	
Saitō, E.	3	2	-								
Saitō, G.R.	1	1	25				21		4		
Saitō, W.	2	2	-								
Saitō de Melo	3	1	1.8				1.7		0.1		
Sasaki	4	2	25	12.5			5	7.5			
Sawada*	3	2	58			23	23	2	10		
Seguchi Chaves	2	3	-								
Seki	3	1	101.9		45.5		47.1		9.3		
Shinomiya	2	1	-								
Shioya*	4	3	177.4			68	72.6		35.8		
Takaishi	4	3	25	13			9		3		
Takaki	0	2	-								
Takeda	3	2	62.1				57.6		4.5		
Taketa	1	1	-								
Taketa Bezerra	2	1	1343.7	200		310	20.2	224	9.5	580	450
Taketa Moreira	3	2	-								
Tanaka	2	2	506.2			25	225		6.2	250	70
Tokuhashi	1	3	198.5			15	133.5		10	40	
Tokuhashi Gonçalves	1	4	-								
Tsunoda*	5	1	105.2			22.8	33.1	20	26.3	3	
Tsuruzaki Prazeres	2	2	420	230		40		25		125	70
Tsuruzaki daSilva	4	1	1046.7			770	204.6		32.1	40	16
Watanabe, C.S.	3	4	-								
Watanabe, L.H.	1	5	-								

Appendix C -- continued

Family Name	M	F	Land	VF	DF	CEF	SF	FL	CR	PT	CT
Watanabe, L.O.	2	3	-								
Watanabe Dias,M	4	2	45	5			39.3		0.7		
Watanabe Dias,V	4	1	53.2		8		24.6		20.6		
Watanabe Dias,W	2	1	see Quatro Bocas Watanabe Dias, M.								
▲Yamada, Ha.*	1	1	12.5				10.5		2		
Yamada, Hi.	1	1	-								
Yamada, M.	1	1	-								
Yamaki Correa	1	3	-								
Yamazaki	1	0	-								
Yoshida	0	2	-								
Total	165	169	14144.3	1330.5	133	6337.1	2019.1	382	490	3452.6	2708
<Agua Branca>											
CAMTA			174.1		15.8		151.3		7		
Chaen Gomes	2	2	259.6	50			50		7	152.6	300
Fujihashi	3	2	62.9				53.9	3	7.5		
Ishikawa	5	4	33.9			9.9	16		8		
Kaiya*	4	4	49	7			23.4		18.6		
▲Kamada	4	2	25				20.2		4.8		
Kikuchi, E.H.*	3	2	52.3				34.3	4	14		
Kikuchi, Z.*	6	2	24.6				7.7		16.9		
Kimura, H.	2	4	5					2.7	2.3		
Kimura, Y.*	4	2	280.6		40		142.5	14	64.1	20	
Kudō*	5	1	51.1				30.9		20.2		
Kuroki	1	3	39.7				29.4		10.3		
Mineshita*	1	1	20.1				7.1		13		
▲Nagano	2	2	226.6			50	23.1		34	120	50
▲Nobusawa	4	1	83			30	8.2		44.8		
Takahashi	1	0	-								
Tokuhashi*	1	1	9.3				5.3		4		
Total	48	33	1396.8	57	55.8	89.9	603.3	23.7	276.5	292.6	350
<Breu 1-2>											
Abe, M.	4	4	15.3				7		8.3		
Abe, T.*	2	1	21			3	9		7	2	
Abe, Y.	1	1	73.5				58.9		9.6	5	
Eikawa, Yo.	5	5	1795.9			1103	223.6	59.6	59.7	350	365
Eikawa, Yu.	2	2	207.3	4			148	2	53.3		
Hashimoto*	3	1	173.1			33	94.4		37.1	8.6	
Ikeda*	2	5	111.6			31.4	25.5	10	12.1	32.6	65
Inada*	3	3	65.3				32.6	6	16.7	10	
Itō*	3	3	65.5				34.8	20	10.7		
▲Kawakami	1	1	62.2				56.9	5	0.3		
▲Kitabayashi, I.	3	2	25				17		8		
▲Kitabayashi, J.	2	4	70.7				46.4		24.3		
Kurogi*	2	3	56.8			5	38.5	1	11.3	1	
▲Matsunaga	1	1	16.6				13.6		3		
Nobayashi	4	4	143.2			20	107.6	3	6.6	6	10
Numazawa*	5	1	1248.7			500	253.8	50	25.9	419	183
Tanaka*	4	3	70.2				53	1	16.2		
Tokumaru	2	3	50.4				10.1	5	35.3		
Total	49	47	4272.3	4	0	1695.4	1230.7	162.6	345.4	834.2	623
<Breu 3-7>											
Arai*	2	4	320	18		89.1	133.8	20.6	53.5	5	
Fujihashi*	4	3	200	30			9.9		17.1	143	80
Kishi	2	4	42.1			13	18.8		10.3		
Konagano*	3	5	1097	195		266	153.9	17.7	114.4	350	144
Kuji	1	0	65		20	10	30		3	2	
Nobayashi	2	2	-								
Oneta*	4	4	40				26.3		13.7		
Sasaki, Yu.*	4	2	68.2	5.1		1	34.5	3	24.6		
Sasaki, Yū.*	3	2	212				111.4	4	28.6	68	
▲Tanisue*	3	3	66.8				49.2	2	15.6		
▲Tsuchiyama	3	1	277.7			26.7			1	250	68
Total	31	30	2388.8	248.1	20	405.8	567.8	47.3	281.8	818	292

Appendix C -- continued

Family Name	M	F	Land	VF	DF	CEF	SF	FL	CR	PT	CT
<Breu 4-6>											
Harayashiki	4	2	see Breu 5-8 Harayashiki								
Inada*	4	4	215.1		18.7		80.8	17	76.6	22	45
Itō*	3	3	410.3		10	23	183.5		101.5	92.3	40
Katō*	4	1	122.3	4		29	46.9	13	29.4		
Miyagawa, E.	3	3	22			1	11.8	3	6.2		
Miyagawa, F.M.*	2	5	174.6			15	72.9	15	71.7		
▲Miyagawa, R.	2	2	80			20	56.2		3.8		
Ono*	2	4	403			131.1	159	1	49.9	62	
Oppata*	4	4	379			43.6	172.1	1.7	139.5	22.1	
Saiki*	3	3	810.4	166		518	0.8	9.6	46	70	
Takaki, Sg.	2	1	1470			4	139	182.5	107	1037.5	800
Takaki, Sy.*	3	2	804.3			147	386.4		99.3	171.6	130
Total	36	34	4891	170	28.7	931.7	1309.4	242.8	730.9	1477.5	1015
<Breu 5-8>											
▲Endō	1	2	40		16		7.5	3.2	13.3		
Harayashiki*	9	10	2621.2	730		383.5	360	75	100	972.7	1200
Hoshina*	3	2	103			27	29.2	4.6	42.2		
Kimura*	2	2	60.3			35.5	6	2	16.8		
Koshōji*	3	2	56			28	16.3		11.7		
Matsunaga	5	4	1170		404.6		362.2	5	178.2	220	100
Matsuzaki	2	3	41.1		16.4	5		12.5	7.2		
▲Mizunuma*	2	1	110			47	38.7		24.3		
Nagai, K.*	8	7	616.3			106	354.1		118.7	37.5	
Nagai, T.	1	5	4955			2824.2	94	180.6	276.2	1580	1100
Shinomiya	6	5	1850	26.8	53.9	966.1	155.2	165	268	215	223
Takano*	2	2	107.8			52.5	29.5		25.8		
Wada	2	5	45				22.5		22.5		
Yoshimura, F.*	1	1	64.8				2.8		38.2	23.8	23
Yoshimura, T.	3	3	141.6			19	75.6	12.6	34.4		
Total	50	54	11982.1	756.8	490.9	4493.8	1553.6	460.5	1177.5	3049	2646
<Ipiranga>											
Adachi	3	2	60		34.5		7		18.5		
▲Hamada	3	2	37.8			31.8	6				
▲Hayashi	3	2	72			72					
Hidaka	4	3	280.4			187.9	25	3.5	14	50	80
Hiramizu*	5	2	175		96.5		20		38.5	20	
Itō*	5	1	165	5	30	36.2	43.3	2	48.5		
Kubo*	2	2	154		90.5	43	7.1		12.4	1	
Matsuki +1	4	5	115			85	24	2	4		
Muroi, H.*	2	3	403		20	178	84.7		120.3		
Muroi, M.*	2	4	129			52	35.1	2	39.9		
Nagahama, F.	5	4	55		8.8	27	5		14.2		
▲Nagahama, M.	4	2	120			78	42				
▲Nagata	3	1	25			12.5	2.5		10		
Niwa	2	1	25	2.4			2	7	13.6		
▲Ōkoshi*	1	2	144			43.5	67.5		33		
Onuki*	3	2	1100	50		522.5	32.3		95.2	400	430
Ōta*	2	4	145	10	32	43	41.9		18.1		
Sasahara*	2	4	100			66.6	6.8	1.1	25.5		
Sasaki*	2	4	25				6.7	1.3	17		
▲Shigeru	1	3	49.8			25	15.3		9.5		
Sugimoto (NIPPAKI)	2	4	9522	691		2015	114		3	6699	2200
Takahashi	3	3	3820	342	21.3	2123.8	53.2		82.7	1197	1270
Takano	1	2	96.9		29.2		57.9		9.8		
Tanizawa*	3	2	50			24	6.8		19.2		
Uwamori*	2	1	364.3			191.3	68		68	37	32
Yajima*	5	4	50			37.5	8		4.5		
Total +1	74	69	17283.2	1100.4	362.8	5895.6	782.1	18.9	719.4	8404	4012

Appendix C -- continued

Family Name	M	F	Land	VF	DF	CEF	SF	FL	CR	PT	CT
<Cuxiu>											
AGRO DENDE DE TA.*			160			105	5		50		
▲Aoki	1	3	50			20	17.9		12.1		
Azumi*	1	5	460.7	25	184.3	138.9	46		62.5	4	
Endō*	2	3	204.5		99	73.2	10		23.3		
Futatsumori*	5	2	262.6			105	63.3		63	31.3	
▲Ikegami	3	2	499.9			427.4	48.5		19	5	
▲Inazawa*	3	4	333.1		128.1	122	49.5		33.5		
Ishii*	3	1	1132.9		49	680.4	277.5	10.5	100.5	15	
▲Kaminosono	3	3	356.3	15		207.3	77.1		21.9	35	
Kawamura	2	3	310.9			145.6	39.8	29	96.5		
Kishimoto	6	6	394	19		226	97.1	1.3	23.6	27	
Kubota, S.	5	6	1087.5			425	296.5	10.5	55.5	300	330
Kubota, Y.	2	1	99.9			15.5	68.1		16.3		
Maeda*	1	3	609.5	118	192.2	170	50.5	3	75.8		
Maki*	2	3	181.7			90.7	36.3	15	39.7		
▲Matsuo	1	1	60			45	9		6		
▲Mukōyama*	1	0	75			40	29.5		5.5		
▲Nakanishi	1	0	26.3				18.3		8	(TAKASAGO)	
Nanbu*	2	3	696	98.4		409.6	99.5		88.5		
▲Naruse	1	0	75			54.2	9		11.8		
Nishida*	4	3	130	20	37	12	38		23		
Ōnishi*	3	2	175		10	93	37.5		34.5		
▲Ono	2	3	25			10	15				
▲Ōta	3	3	25			12	10.2		2.8		
▲Ōtani	2	3	25			10	12.5		2.5		
Sugaya*	3	3	633.2	4	89.1	388.4	99.5		52.2		
Sugita, H.*	2	3	1273		37	823.5	116.6	50	18.4	227.5	100
Sugita, T.	3	4	225			100	88		37		
Takahara*	3	1	109.3			44	41.4		23.9		
▲Takaoka*	1	2	110			71.4	20		18.6		
Tsubaki* +1	4	7	250.5			46			25	179.5	30
Umezawa*	3	3	75	50	6.4		2.5	2	14.1		
Watanabe, K.*	4	2	182	23.5		72.5	64.6		21.4		
Watanabe, M.	3	2	101.4			60.5	10.4	7	23.5		
Yamada*	4	5	200			71	114.8		4.2	10	4
▲Yamamoto (APIL)	1	0	238			238					
Total +1	90	95	10853.2	372.9	832.1	5553.1	2019.4	128.3	1114.1	834.3	464

APPENDIX D

TROPICAL FRUIT PROMOTION POSTERS OF ***NCR*** AND ***CAMTA*** IN 1995

Figure D-1. NCR windshield sticker "I Love Tomé-Açu"

Appendix D--continued

Figure D-2. CAMTA tropical fruit promotion poster

APPENDIX E
CROPS PRESENT ON JAPANESE-BRAZILIAN FARMS AT TOMÉ-AÇU IN 1996, ACCORDING TO THEIR YEAR OF PLANTING

Note: Farm owners sometimes answered '- (not available)' for the number of individuals planted, and this response was counted as a zero. This usually occurred when plant spacing was irregular, or the questioned species was an associate minor crop. Hence, a value for the number of individuals present may exceed the corresponding value for number planted. 'GT' means gross total of planted area, and 'RE' means replanted area, which was deducted to obtain the 'NT,' or net total area for each crop. An unavailable area (mostly of an associate minor crop) was counted as zero hectares.

Crop	Yr	Area	Numb. Planted	Numb. Present	Crop	Yr	Area	Numb. Planted	Numb. Present
Acacia	93	-	-	8	Acerola	88	0.6	136	120
					(cont.)	89	3.3	1430	1170
Açai	71	1	1000	1000		90	22	7805	7305
Palm	72	2.3	1500	1500		91	31.1	12501	11827
	76	2.8	300	300		92	38	13788	12663
	77	0.3	100	100		93	31.1	13473	10296
	78	2.3	400	400		94	28	9340	9109
	80	11.5	10500	10350		95	16.3	5703	5454
	82	1	300	300		96	17.1	6097	5503
	83	0.7	1200	1000		?	2	-	300
	85	2.4	260	260		GT	189.9	70443	63907
	86	4.2	1150	1150		RE	-23		
	87	3.6	1000	1000		NT	166.9		
	89	1.4	2100	2100					
	90	2.5	800	810	Ameixa	66	-	-	2
	91	0.4	125	65					
	92	4.1	2930	2930	Andi-	63	-	1	1
	93	6.9	3300	3300	roba	70	-	2	2
	94	15.5	5475	5450		71	1	200	100
	95	12.6	3650	3045		72	11.9	2000	1900
	96	13.3	3450	3141		73	4.7	2300	2100
	?	61.8	-	-		75	2	600	600
	GT	150.6	39540	38201		76	22.6	7310	6478
	RE	-6				77	18	1900	1606
	NT	144.6				79	11.7	1138	732
						80	5	100	129
Acapu	65	-	-	35		81	5.1	1000	1038
	94	-	100	-		83	7.5	3800	2500
	GT	-	100	35		84	-	-	8
						85	19.8	5936	1395
Acerola	80	0.2	100	100		86	13	2015	1598
	87	0.2	70	60		87	5	500	460

Appendix E -- continued

Crop	Yr	Area	Numb. Planted	Numb. Present
Andi-roba (cont.)	88	5.5	320	460
	89	1.5	750	340
	92	-	-	3
	94	1	153	134
	95	-	100	50
	?	-	-	23
	GT	135.3	30125	21657
	RE	-1		
	NT	134.3		
Araça Boi	93	0.2	200	200
	94	-	10	10
	95	2	400	400
	96	0.2	90	80
	GT	2.4	700	690
Araça Costa Rica	96	0.4	132	132
Araça Pera	94	0.2	24	23
	95	0.3	205	185
	96	4.5	1380	1310
	GT	5	1609	1518
Avoca-do	56	-	-	1
	77	1	100	25
	80	1	50	20
	81	5	400	102
	85	-	-	5
	87	7.4	608	599
	88	0.8	153	123
	89	1.1	190	90
	90	4	315	257
	91	2.7	314	141
	92	-	-	15
	93	4.6	332	262
	94	0.1	17	17
	95	8.6	592	540
	96	21.7	2187	1726
	GT	58	5258	3923
	RE	-8.4		
	NT	49.6		
Bacabi Palm	76	1.5	200	200
	92	1.4	875	440
	GT	2.9	1075	640
Bacuri	71	-	10	13
	76	-	-	13
	80	2.6	-	117
	81	14	1000	30
	86	-	-	2
	88	-	-	1
	91	-	-	3
	93	2	200	100
	94	2.1	210	3
	95	-	500	100
	96	-	60	60
	?	-	-	5
	GT	20.7	1980	447

Crop	Yr	Area	Numb. Planted	Numb. Present
Bamboo	89	0.2	-	-
Banana	90	1.2	225	230
	92	1.1	660	330
	96	0.7	-	-
	?	3.9	-	560
	GT	6.9	885	1120
Baru	94	-	173	106
Biribá	96	-	20	20
Black Pepper	86	3.5	5000	2000
	87	4	4750	900
	88	30.5	17200	10300
	89	6.2	8500	4900
	90	86.9	119390	51340
	91	152.7	206478	90700
	92	121.5	177271	99628
	93	126.6	159072	111240
	94	150.2	190424	143989
	95	194.1	257120	195957
	96	236.7	278160	244099
	GT	1112.9	1423365	955053
	RE	-151.2		
	NT	961.7		
Brazil-nut	32	-	-	23
	33	-	-	35
	35	-	-	4
	36	4	-	146
	46	-	-	5
	56	2.5	30	120
	66	4	-	201
	67	2	-	50
	70	-	-	10
	71	14	621	580
	72	-	30	30
	73	1.1	38	46
	74	2	63	39
	75	28.5	275	719
	76	10.3	10	124
	77	1	20	26
	78	3	50	40
	79	0.5	8	9
	80	17.2	546	171
	81	1	50	19
	82	4	320	100
	83	2.3	-	29
	84	1.5	58	116
	86	5.2	85	116
	87	-	-	80
	88	6.3	440	486
	89	10.5	314	285
	90	-	-	4
	91	1.9	64	62
	92	2.5	148	140
	93	-	-	3
	94	-	10	10

Appendix E -- continued

Crop	Yr	Area	Numb. Planted	Numb. Present
Brazil-nut (cont.)	95	21.3	1617	1340
	96	10	918	480
	GT	156.6	5715	5648
	RE	-1.1		
	NT	155.5		
Bread-fruit	92	1.1	165	83
Cacao	65	24	25400	11850
	66	2.8	2629	1570
	68	23.6	16000	10200
	69	10	10000	5100
	70	79.9	69200	31850
	71	61.9	58739	35630
	72	52.9	40550	20590
	73	7.1	7500	5340
	74	134.2	132836	87620
	75	216.4	201968	135360
	76	488.6	422572	271161
	77	98.6	82905	59835
	78	149.1	162676	115140
	79	52.7	44909	23805
	80	110.8	108481	78760
	81	348.6	292220	197000
	82	48.9	33536	21880
	83	41	35150	24050
	84	21	24083	15550
	85	68.5	48746	34670
	86	110.6	77328	55315
	87	46.3	21654	16075
	88	64.3	22494	16243
	89	11.3	10348	8025
	90	9.8	4950	3790
	91	15	4500	4420
	92	6	2500	1300
	93	7	300	400
	94	3	1000	1000
	95	15	4600	4500
	96	15.4	3750	3450
	GT	2344.3	1973524	1301479
	RE	-50.8		
	NT	2293.5		
Cajá / Tapere-ba	73	-	-	2
	76	-	-	2
	78	0.5	10	10
	92	-	40	40
	94	-	3	3
	GT	0.5	53	57
Camu-Camu	92	0.1	80	80
	93	7.3	4500	4350
	94	1	620	588
	95	1	50	50
	GT	9.4	5250	5068
Candle-nut	73	-	-	3
	?	-	-	52
	GT	-	-	55

Crop	Yr	Area	Numb. Planted	Numb. Present
Carambola	80	1	10	10
	88	0.7	60	60
	90	2	200	200
	92	0.2	69	119
	93	2.6	235	180
	95	0.8	300	240
	96	3.3	1250	1250
	GT	10.6	2124	2059
Cashew	86	-	-	2
	90	0.5	115	35
	91	5	500	400
	92	0.7	260	255
	93	0.8	400	250
	94	4.6	1670	1450
	95	12	2777	1827
	96	3.5	1027	802
	GT	27.1	6749	5021
Cassava	95	7	-	-
	96	4.9	-	-
	GT	11.9	-	-
Cedro	74	-	-	18
	75	1	35	29
	76	0.1	29	78
	77	-	20	10
	78	6	100	147
	80	1	55	15
	81	1.1	205	200
	82	-	-	28
	83	-	-	8
	84	-	20	17
	85	-	-	13
	86	3.3	95	117
	88	-	-	12
	93	-	30	60
	96	1.4	120	120
	?	-	-	7
	GT	13.9	709	879
Cedro Branco	76	0.5	112	111
	93	-	100	50
	95	-	-	27
	GT	0.5	212	188
Coconut	56	0.5	25	25
	66	0.5	25	25
	71	0.4	200	10
	76	2	350	255
	80	2	408	400
	83	-	25	23
	85	0.2	60	50
	86	9.3	4050	3150
	89	2	300	300
	90	2.4	226	200
	91	2.5	500	450
	92	0.8	150	150
	93	5.9	800	650

Appendix E -- continued

Crop	Yr	Area	Numb. Planted	Numb. Present
Coconut (cont.)	94	1.5	200	200
	96	1.4	203	197
	GT	31.4	7522	6085
Coffee	72	0.1	50	50
	73	14	8000	8000
	74	0.5	-	-
	80	5	3600	2100
	81	0.2	435	400
	83	1	-	-
	88	1.5	160	160
	93	0.4	169	166
	?	1.5	-	-
	GT	24.2	12414	10876
Comi-quie	80	1.5	20	10
Copaiba	94	-	100	100
Cuia-rana	94	-	70	62
Cumaru	62	0.2	80	30
	64	1	-	250
	76	-	-	10
	94	-	35	25
	?	-	-	5
	GT	1.2	115	320
Cupu-açu	72	0.5	400	400
	73	3	1000	500
	74	0.2	-	100
	76	1.7	1445	740
	77	11	2770	1945
	78	14	2500	2380
	79	0.5	175	4150
	80	5.6	2000	1500
	81	6.3	600	290
	82	0.7	250	250
	83	2	820	820
	84	9.6	3956	3380
	85	9.8	4350	2550
	86	41	16424	12880
	87	91.5	26820	22268
	88	95.3	32091	27093
	89	96.8	38972	21259
	90	83.2	26406	21257
	91	99.1	25042	18405
	92	133.4	47655	37172
	93	160	54908	47632
	94	222.8	69660	51603
	95	134.9	20240	17378
	96	119.2	21668	18402
	?	-	-	50
	GT	1350.1	404147	312404
	RE	-208.4		
	NT	1141.7		
Custard Apple	91	1.1	391	315
	92	-	20	20

Crop	Yr	Area	Numb. Planted	Numb. Present
C.Apple (cont.)	94	-	-	50
	GT	1.1	411	385
Cutite	78	-	5	5
	?	-	-	2
	GT	-	5	7
Euca-lyptus	89	-	20	11
Fava-Maputigui	94	-	33	18
Feijão Bean	96	0.8	-	-
Freijó	71	1	200	120
	72	3	300	400
	74	34.9	10580	7314
	75	25.9	7845	6709
	76	57.6	13766	6847
	77	6	5900	4220
	78	0.5	20	148
	79	0.5	300	270
	80	7.2	600	852
	81	8	750	695
	85	-	-	2
	86	1	60	190
	88	3.7	720	750
	89	2.2	363	326
	90	1.2	520	470
	91	3.2	1450	1420
	93	11.3	1944	1370
	94	9.6	1595	769
	95	-	-	10
	96	1.4	120	120
	?	-	-	71
	GT	178.2	47033	33073
Genipa Fruit	76	-	2	3
	78	-	-	1
	91	-	10	10
	?	-	-	1
	GT	-	12	15
Gmelina	66	-	6	6
	83	1.2	-	26
	85	28	560	1241
	86	2.7	200	200
	87	1	-	90
	88	3	-	80
	?	5	125	157
	GT	40.9	891	1800
Guarana	75	5.9	2400	740
	78	-	10	10
	81	0.3	-	100
	85	1	300	250
	96	0.6	180	90
	GT	7.8	2890	1190
Guarana de Caroço	95	-	-	5

Appendix E -- continued

Crop	Yr	Area	Numb. Planted	Numb. Present
Guava	80	0.7	100	100
	92	0.4	100	98
	93	0.3	143	143
	94	1	360	360
	95	2.5	1340	1100
	96	1.8	412	412
	GT	6.7	2455	2213
Guinea Chestnut	78	-	-	10
	86	1	200	50
	89	1.5	-	100
	GT	2.5	200	160
Ipê	74	-	9	7
	76	-	-	10
	77	-	7	7
	81	-	-	1
	86	-	-	20
	88	-	20	15
	90	-	-	140
	91	-	-	72
	92	1.7	574	550
	93	1.8	280	285
	94	-	401	341
	95	10.3	953	1608
	96	4.9	840	963
	?	-	-	2
	GT	18.7	3084	4021
Jaboticaba	74	0.1	65	60
	76	-	3	3
	95	-	-	110
	GT	0.1	68	173
Jacaranda da Bahia	76	-	30	27
	85	-	-	35
	?	-	-	1
	GT	-	30	63
Jacaranda do Pará	94	-	185	152
	95	1	-	245
	GT	1	185	397
Jackfruit	73	-	-	10
	75	-	-	22
	87	5.6	560	560
	92	0.4	75	75
	93	0.4	75	38
	?	-	-	2
	GT	6.4	710	707
Jatobá	78	-	-	2
Jutaí Açu	94	-	98	49
Jutaí Mirim	94	-	53	50
	95	-	-	10
	GT	-	53	60

Crop	Yr	Area	Numb. Planted	Numb. Present
Laiti	76	-	-	2
Leucaena	94	-	240	240
	95	2	336	346
	GT	2	576	586
Lime	79	0.4	100	20
	87	0.2	50	40
	88	2	350	325
	90	0.5	10	6
	91	0.4	200	200
	92	-	-	30
	94	0.8	165	150
	95	0.4	100	98
	GT	4.7	975	869
Louro Vermelho	80	-	2	2
Macacauba	74	0.3	-	43
	77	21.6	968	1155
	80	0.7	-	46
	?	-	-	8
	GT	22.6	968	1252
Mahogany	53	-	-	2
	60	-	-	4
	75	1	870	714
	76	-	29	70
	77	-	2	2
	78	3.7	35	105
	79	0.2	100	101
	80	6.9	-	353
	81	1.1	205	219
	84	-	-	20
	85	0.2	-	50
	86	2.3	2	197
	88	-	50	31
	89	0.5	500	508
	90	0.8	230	203
	91	0.6	75	150
	92	2.9	348	330
	93	1.9	1230	680
	94	26	1729	1520
	95	38.5	3120	3217
	96	5	275	400
	?	-	2	8
	GT	91.6	8802	8884
	RE	-3		
	NT	88.6		
Mammee Apple (Abricó)	85	-	20	7
	88	0.4	-	21
	89	1.5	258	250
	90	-	-	10
	91	-	66	61
	93	-	50	46
	95	1	781	695
	96	-	7	7
	GT	2.9	1182	1097

Appendix E -- continued

Crop	Yr	Area	Numb. Planted	Numb. Present	Crop	Yr	Area	Numb. Planted	Numb. Present
M.Apple	RE	-			Moro-	77	-	2	2
(cont.)	NT	2.9			toto	85	-	-	2
						94	-	8	1
Man-	71	0.1	20	10		GT	-	10	5
darin	73	-	-	10					
Oranges	78	-	20	8	Mucuna	96	4	-	-
	88	0.5	100	90	Preta				
	89	0.2	50	40	Muruci	76	-	20	20
	90	1.7	280	276		90	-	10	10
	91	0.1	50	50		94	1	50	40
	92	0.2	66	40		96	1.5	650	600
	GT	2.8	586	524		GT	2.5	730	670
Mango	56	-	-	2	Neem	85	-	-	8
	76	0.2	3	18					
	77	3.6	200	200	Nutmeg	78	-	-	8
	78	0.3	18	18		96	0.6	150	150
	80	4.5	30	30		?	-	-	18
	82	0.6	50	40		GT	0.6	150	176
	83	0.3	80	80					
	84	7	410	210	Oil	80	4.9	1400	1400
	85	1.5	170	170	Palm	84	28.8	4100	3905
	86	1.3	50	50		85	190.9	27371	26383
	89	-	-	7		86	293.7	41671	41257
	90	0.3	20	20		87	39.5	5011	4778
	93	2.6	410	280		88	21	3418	3415
	94	1	153	80		89	5	715	715
	96	0.9	55	55		GT	583.8	83686	81853
	?	0.5	-	-					
	GT	24.6	1649	1260	Papaya	86	-	-	10
	RE	-0.3				93	0.8	300	268
	NT	24.3				95	0.5	150	147
						96	0.6	450	450
Mango-	75	0.5	70	60		GT	1.9	900	875
steen	78	0.3	50	50					
	82	0.7	250	250	Paradise	88	0.4	-	26
	83	0.7	100	95	Nut	?	-	-	1
	85	2	400	383		GT	0.4	-	27
	86	2.1	440	329					
	87	1.5	50	45	Para-	76	0.6	300	300
	88	1.3	218	167	para	85	-	-	2
	89	0.2	100	100		GT	0.6	300	302
	90	0.6	150	156					
	91	-	80	72	Paricá	81	13.1	2610	962
	92	1.2	190	116		83	2.5	50	58
	93	1.2	320	305		88	0.5	-	58
	94	1.3	152	91		91	-	-	100
	GT	13.6	2570	2219		94	-	36	-
	RE	-1				96	0.1	200	200
	NT	12.6				GT	16.2	2896	1378
Marang	94	-	5	2	Passion	92	0.1	75	75
	95	-	3	3	Fruit	93	2.7	1254	684
	96	3.2	600	515		94	47.8	27172	21002
	GT	3.2	608	520		95	195.5	98078	84154
						96	179.8	92670	87776
Marupá	77	-	1	2		GT	425.9		
						RE	-108.8		
						NT	317.1		

Appendix E -- continued

Crop	Yr	Area	Numb. Planted	Numb. Present
Pasture Grasses	70	4		
	72	115		
	73	55		
	74	20		
	75	248.7		
	76	1384.2		
	77	1736.5		
	78	5		
	79	200		
	80	877.1		
	81	596.7		
	82	8		
	83	150		
	84	371		
	85	3967.8		
	86	1034.2		
	87	500		
	88	330.5		
	89	730		
	90	861		
	91	790.6		
	92	1363.5		
	93	2134.9		
	94	817.9		
	95	1245.5		
	96	707.9		
	?	432		
		20687		
	RE	-25		
	NT	20662		
Pau Brasil Falso	94	-	2	2
	?	-	-	2
	GT	-	2	4
Pau Ferro	81	-	-	1
Pau Rosa	85	-	-	14
Peach Palm	74	0.7	100	100
	75	0.1	50	50
	83	0.3	110	106
	86	0.5	50	40
	91	1.3	820	575
	92	-	10	10
	94	-	23	23
	95	5.8	3100	3100
	96	16.4	68600	61700
	GT	25.1	72863	65704
Pine	71	-	-	2
	76	-	-	2
	?	-	-	7
	GT	-	-	11
Pine-apple	95	4.6	22600	22530
	96	3.7	59150	59150
	GT	8.3	81750	81680
Piquiá	56	-	-	1
	76	-	-	5
	77	-	8	8
	78	0.5	10	10
	79	0.5	50	50
	81	-	-	3
	85	-	-	5
	92	-	-	2
	94	-	35	0
	?	-	-	7
	GT	1	103	91
Piquia-rana	56	-	-	1
Pitomba	76	-	-	1
Puxuri	70	0.2	120	50
	78	1.1	200	120
	80	1	200	50
	84	0.9	150	80
	87	1.5	-	10
	88	0.6	30	30
	89	1.2	280	160
	94	0.8	100	105
	96	1.3	366	366
	GT	8.6	1446	971
Rambu-tam	84	-	10	10
	85	-	-	8
	90	1.1	300	240
	92	0.9	126	124
	94	-	10	10
	GT	2	446	392
Rubber Tree	35	-	-	1
	46	-	-	8
	59	-	7	7
	60	2	1000	400
	64	4	400	450
	65	19.2	1000	1920
	66	23.5	9362	5097
	67	9	2000	800
	68	3	2000	1000
	69	12	800	2050
	70	9.8	6460	790
	71	0.1	30	20
	72	14.9	5738	2860
	73	22.5	6200	3990
	74	26.4	10740	8250
	75	12	975	1005
	76	38.6	12795	7717
	77	45.3	-	1530
	78	18.7	6530	5495
	79	2	1500	1000
	80	33.5	16710	13183
	81	90	24784	18280
	82	78.7	32197	21245
	83	48.2	20382	16110
	84	170.9	55348	42400

Appendix E -- continued

Crop	Yr	Area	Numb. Planted	Numb. Present
Rubber Tree (cont.)	85	111	47217	40935
	86	63.5	22205	15490
	87	69	26344	19243
	88	68.8	23894	19011
	89	23.1	6450	5180
	90	59.3	16306	12354
	91	1	300	260
	92	7.3	2400	1590
	93	10	4862	4550
	?	-	-	2
	GT	1097.3	366936	274223
	RE	-15		
	NT	1082.3		
Sabiá	88	0.2	100	100
	91	-	-	20
	GT	0.2	100	120
Sapo-dilla	73	-	-	20
	80	0.7	50	50
	84	-	25	25
	85	0.5	36	18
	88	0.4	20	18
	90	0.5	20	21
	91	0.4	144	135
	92	-	44	44
	96	-	-	10
	GT	2.5	339	341
Sapota de Solimões	96	-	2	2
Sassa-fras	?	-	-	10
Sendan	?	-	-	5
Shadock	73	-	-	10
Soursop	80	0.2	100	10
	81	4.5	1600	1000
	83	1	250	250
	86	5.9	920	620
	88	4	1199	1074
	89	9.7	10158	1665
	90	13.5	2913	2414
	91	17	6437	5822
	92	25.3	7709	6394
	93	32.3	9950	8498
	94	23.4	5936	4556
	95	30.1	9208	7598
	96	42.4	8535	8098
	GT	209.3	64915	47999
	RE	-29.6		
	NT	179.7		
Sucupi-ra	77	-	20	20
Suma-uma	73	0.5	90	70

Crop	Yr	Area	Numb. Planted	Numb. Present
Sweet Oranges	70	0.5	-	25
	71	0.1	20	10
	75	0.5	70	50
	84	1.2	320	305
	87	-	25	24
	90	1.2	165	164
	91	0.6	160	160
	92	2.8	625	623
	94	-	70	70
	96	0.5	116	116
	GT	7.4	1571	1547
Tachi Preto	94	-	30	-
Tama-rind	78	-	10	10
Tata-juba	81	-	10	10
	94	-	131	22
	96	1.4	100	100
	GT	1.4	241	132
Teak	94	-	60	60
	95	13.8	4086	3111
	96	1.4	120	120
	GT	15.2	4266	3291
Tento Amarelo	94	-	72	32
	95	-	-	10
	GT	-	72	42
Termi-nalia	81	-	-	10
Ucuuba	76	-	-	4
	77	-	4	4
	81	1	238	190
	82	-	-	10
	?	-	-	3
	GT	1	242	211
Urucu	89	35	18000	16000
	90	1	1000	900
	GT	36	19000	16900
Uxi	71	-	1	1
	81	-	-	4
	86	-	-	7
	88	-	-	2
	90	-	-	20
	96	-	8	8
	GT	-	9	42
Vanilla	86	0.2	-	80
	90	0.1	300	300
	92	0.8	700	665
	94	0.3	100	100
	GT	1.4	1100	1145
unidentified and other fruit/timber trees			5	35

APPENDIX F
CROPS BY CROPPING METHODS ON
JAPANESE-BRAZILIAN FARMS AT TOMÉ-AÇU (1996)

Table F-1. Monoculture : 24,688.3 ha (Pasture 20,664.7 ha)

Crop Name	Original Planting area (ha)	# planted	# present	Replanting (ha)	#planted	#present	Present Total #
Acacia							
Açai Palm	79.3	14810	48152				48152
Acapu							
Acerola	111.6	44781	39930	8.3	2090	1922	41852
Ameixa							
Andiroba	17.1	7996	6760	1	-	172	6932
Araça Boi							
Araça Costa Rica							
Araça Pera	2.2	612	602				602
Avocado	13.9	1629	1042	5.7	230	197	1239
Bacabi Palm	1.4	875	440				440
Bacuri							
Bamboo	0.2	-	-				-
Banana	4.6	-	500				500
Baru							
Biribá							
Black Pepper	590.4	874027	594029	112.7	58773	43262	637291
Brazilnut	25.8	958	586				586
Breadfruit							
Cacao	1210	1099792	731300	15.7	2910	2870	734170
Caja / Tapereba							
Camu Camu	0.1	80	80				80
Candlenut							
Carambola	1.2	185	170				170
Cashew	7.9	2907	2382				2382
Cassava	8.9	-	-				-
Cedro							
Cedro Branco							
Coconut	25	6418	5035				5035
Coffee	3.1	1664	1126				1126
Comiquie							
Copaiba							
Cuiarana							
Cumaru	0.2	80	30				30
Cupuaçu	436.3	167584	126278	59.1	2448	3061	129339
Custard Apple (Ata)							
Cutite							
Eucalyptus							
Fava Maputigui							
Feijão Bean	0.8	-	-				-
Freijó	15.7	2800	2650				2650
Genipa Fruit							
Gmelina							
Guarana	0.3	-	100				100
Guarana de Caroço							
Guava	1.3	383	381				381
Guinea Chestnut	1.5	-	100				100
Ipê (*Tabebuia* spp.)	1.3	703	633				633
Jaboticaba	0.1	65	60				60

Table F-1--continued

Crop Name	Original Planting area (ha)	# planted	# present	Replanting (ha)	#planted	#present	Present Total #
Jacaranda da Bahia							
Jacaranda do Pará							
Jackfruit							
Jatobá							
Jutaí Açu							
Jutaí Mirim							
Laiti							
Leucaena							
Lime	2.6	723	608				608
Louro Vermelho							
Macacauba							
Mahogany	3.9	980	1150	1.6	70	70	1220
Mammee Apple (Abricó)							
Mandarin Oranges	1	360	346				346
Mango	8.5	696	613				613
Mangosteen	3.8	675	600				600
Marang							
Marupa							
Morototo							
Mucuna Preta	4	-	-				-
Muruci							
Neem							
Nutmeg	0.6	150	150				150
Oil Palm	563.6	80666	78833				78833
Papaya	0.5	300	300				300
Paradise Nut							
Parapara	0.6	300	300				300
Paricá	1.7	320	395				395
Passionfruit	177.2	104089	95324	3.8	550	540	95864
Pasture Grasses	20639.7	-	-	25	-	-	-
Pau Brasil Falso							
Pau Ferro							
Pau Rosa							
Peach Palm	21.1	56730	51161				51161
Pine							
Pineapple	7.7	79000	78870				78870
Piquia	0.5	50	50				50
Piquiarana							
Pitomba							
Puxuri	4.5	940	690				690
Rambutam	1.1	300	240				240
Rubber Tree	544.6	226782	163825	9	3000	2000	165825
Sabiá	0.2	100	120				120
Sapodilla							
Sapota de Solimões							
Sassafras							
Sendan							
Shadock							
Soursop	74.4	25614	22065	5.8	837	562	22627
Sucupira							
Sumauma							
Sweet Oranges	3.3	1055	1063				1063
Tachi Preto							
Tamarindo							
Tatajuba							
Teak	1.9	2606	2238				2238
Tento Amarelo							
Terminalia							
Ucuuba							
Urucu	36	19000	16900				16900
Uxi							
Vanilla	0.1	300	300				300
unidentified fruit							

Table F-1--continued

Crop Name	Original Planting area (ha)	# planted	# present	Replanting (ha)	#planted	#present	Present Total #
unidentified tree							
other trees							
Total	24663.3	2830085	2078507	247.7	70908	54656	2133163
Reservoir	28.5						

Pasture: Cattle 12,886; Goats 35; Water Buffaloes 70; Sheep 266; Horses, Mules & Donkeys 263
Reservoir: Bagre Africano 18,000; Curimata 300,000; Tambacu 150,000; Carp, Tilapia, Pirarucu, etc.
Others: Pigs, Hens, Ducks, etc.

Table F-2. Intercropped: 2,527.2 ha (Pasture 12.0 ha)

Crop Name	Original Planting area (ha)	# planted	# present	Replanting (ha)	#planted	#present	Present Total #
Acacia							
Açai Palm	16.1	4413	4290	5	123	115	4405
Acapu							
Acerola	31.9	11128	9583	10.5	3750	3610	13193
Ameixa							
Andiroba	6.4	3000	2240				2240
Araça Boi							
Araça Costa Rica							
Araça Pera	0.6	160	160				160
Avocado	7.4	578	541	-	25	25	566
Bacabi Palm							
Bacuri							
Bamboo							
Banana	3.8	885	555				555
Baru							
Biribá							
Black Pepper	354.8	458923	291457	38.5	18090	15510	306967
Brazilnut	19.5	691	768				768
Breadfruit							
Cacao	917.7	795423	512296	22.6	3300	3300	515596
Caja / Tapereba							
Camu Camu	2	1000	900				900
Candlenut							
Carambola							
Cashew	5.5	600	420				420
Cassava							
Cedro	0.6	55	55				55
Cedro Branco							
Coconut	2.4	496	395				395
Coffee	0.5	-	-				-
Comiquie	1.5	20	10				10
Copaiba							
Cuiarana							
Cumaru							
Cupuaçu	249.4	89627	68485	58.1	1220	2140	70625
Custard Apple	1.1	391	315				315
Cutite							
Eucalyptus							
Fava Maputigui							
Feijão Bean							
Freijó	16.3	5156	4072				4072
Genipa Fruit							
Gmelina							
Guarana							
Guarana de Caroço							
Guava	0.7	100	100				100

Table F-2--continued

Crop Name	Original Planting area (ha)	# planted	# present	Replanting (ha)	#planted	#present	Present Total #
Guinea Chestnut							
Ipê (*Tabebuia* spp.)							
Jaboticaba							
Jacaranda da Bahia							
Jacaranda do Pará							
Jackfruit							
Jatobá							
Jutaí Açu							
Jutaí Mirim							
Laiti							
Leucaena							
Lime	1.2	207	195				195
Louro Vermelho							
Macacauba							
Mahogany	1.5	-	333				333
Mammee Apple							
Mandarin Oranges	0.3	86	50				50
Mango	1.6	230	130				130
Mangosteen	6.2	1220	1038	0.5	-	45	1083
Marang							
Marupá							
Morototo							
Mucuna Preta							
Muruci							
Neem							
Nutmeg							
Oil Palm	20.2	3020	3020				3020
Papaya	1.4	600	547				547
Paradise Nut							
Parapara							
Paricá	5	2000	500				500
Passionfruit	125.8	67387	56858	3.8	225	215	57073
Pasture Grasses	12	-	-				-
Pau Brasil Falso							
Pau Ferro							
Pau Rosa							
Peach Palm							
Pine							
Pineapple							
Piquiá							
Piquiarana							
Pitomba							
Puxuri	1	200	50				50
Rambutam							
Rubber Tree	296	98703	77982	4	450	200	78182
Sabiá							
Sapodilla	0.9	56	36				36
Sapota de Solimões							
Sassafras							
Sendan							
Shadock							
Soursop	18.9	5427	4542	4.8	320	500	5042
Sucupira							
Sumauma							
Sweet Oranges	0.8	94	74				74
Tachi Preto							
Tamarindo							
Tatajuba							
Teak	0.4	375	310				310
Tento Amarelo							
Terminalia							
Ucuuba							
Urucu							

Table F-2--continued

Crop Name	Original Planting area (ha)	# planted	# present	Replanting (ha)	#planted	#present	Present Total #
Uxi							
Vanilla							
unidentified fruit							
unidentified tree							
other trees							
Sub Total	2131.4	1552251	1042307	147.8	27503	25660	1067967
Fruit Orchard	10.9						
Tree Garden	0.4						
Vegetable Field	4.2						
Homegarden	344.8						
Public Facilities	35.5						
Total	2527.2						

Table F-3. Associate Crops: 1,557.7 ha (Pasture 10.3 ha) - planted inside the total area of Table F-2

Crop Name	Original Planting area (ha)	# planted	# present	Replanting (ha)	#planted	#present	Present Total #
Acacia	-	-	8				8
Açai Palm	49.2	20167	19150	1	27	26	19176
Acapu	-	100	35				35
Acerola	23.4	8694	8862				8862
Ameixa	-	-	2				2
Andiroba	110.8	19129	12485				12485
Araça Boi	2.4	700	690				690
Araça Costa Rica	0.4	132	132				132
Araça Pera	2.2	837	756				756
Avocado	28.3	2695	2019	1.7	101	99	2118
Bacabi Palm	1.5	200	200				200
Bacuri	20.7	1980	447				447
Bamboo	0.2	-	-				-
Banana	-	-	65				65
Baru	-	173	106				106
Biribá	-	20	20				20
Black Pepper	16.5	13552	10795				10795
Brazilnut	110.2	4060	4289	1.1	6	5	4294
Breadfruit	1.1	165	83				83
Cacao	165.8	71299	51313	12.5	800	400	51713
Caja / Tapereba	0.5	53	57				57
Camu Camu	7.3	4170	4088				4088
Candlenut		-	55				55
Carambola	9.4	1939	1889				1889
Cashew	13.7	3242	2219				2219
Cassava	1.5	-	-				-
Cedro	13.3	654	814	-	-	10	824
Cedro Branco	0.5	212	188				188
Coconut	4	608	655				655
Coffee	20.6	10750	9750				9750
Comiquie							-
Copaiba	-	100	100				100
Cuiarana	-	70	62				62
Cumaru	1	35	290				290
Cupuaçu	456	137458	106814	79.7	5810	5626	112440
Custard Apple	-	20	70				70
Cutite	-	5	7				7
Eucalyptus	-	20	11				11
Fava Maputigui	-	33	18				18
Feijão Bean							-
Freijó	146.2	39077	26351				26351
Genipa Fruit	-	12	15				15
Gmelina	40.9	891	1800				1800

Table F-3--continued

Crop Name	Original Planting area (ha)	# planted	# present	Replanting (ha)	#planted	#present	Present Total #
Guarana	7.5	2890	1090				1090
Guarana de Caroço	-	-	5				5
Guava	4.7	1972	1732				1732
Guinea Chestnut	1	200	60				60
Ipê (*Tabebuia* spp.)	16.4	2381	3263	1	-	125	3388
Jaboticaba	-	3	113				113
Jacaranda da Bahia	-	30	63				63
Jacaranda do Pará	1	185	397				397
Jackfruit	6.4	710	707				707
Jatobá	-	-	2				2
Jutaí Açu	-	98	49				49
Jutaí Mirim	-	53	60				60
Laiti	-	-	2				2
Leucaena	2	576	586				586
Lime	0.9	45	66				66
Louro Vermelho	-	2	2				2
Macacauba	22.6	968	1252				1252
Mahogany	83.2	7729	7308	1.4	23	23	7331
Mammee Apple	2.9	1154	1081	-	28	16	1097
Mandarin Oranges	1.5	140	128				128
Mango	14.2	693	487	0.3	30	30	517
Mangosteen	2.6	665	526	0.5	10	10	536
Marang	3.2	608	520				520
Marupá	-	1	2				2
Morototo	-	10	5				5
Mucuna Preta						-	
Muruci	2.5	730	670				670
Neem	-	-	8				8
Nutmeg	-	-	26				26
Oil Palm							-
Papaya	-	-	28				28
Paradise Nut	0.4	-	27				27
Parapara	-	-	2				2
Paricá	9.5	576	483				483
Passionfruit	108.8	46878	40584	6.5	120	170	40754
Pasture Grasses	10.3	-					-
Pau Brasil Falso	-	2	4				4
Pau Ferro	-	-	1				1
Pau Rosa	-	-	14				14
Peach Palm	4	16133	14543				14543
Pine	-	-	11				11
Pineapple	0.6	2750	2810				2810
Piquiá	0.5	53	41				41
Piquiarana	-	-	1				1
Pitomba	-	-	1				1
Puxuri	3.1	306	231				231
Rambutam	0.9	146	152				152
Rubber Tree	241.7	38001	30066	2	-	150	30216
Sabiá	-	-	20				20
Sapodilla	1.6	283	305				305
Sapota de Solimões	-	2	2				2
Sassafras	-	-	10				10
Sendan	-	-	5				5
Shadock	-	-	10				10
Soursop	86.4	31441	19154	19	1276	1176	20330
Sucupira	-	20	20				20
Sumauma	0.5	90	70				70
Sweet Oranges	3.3	422	410				410
Tachi Preto	-	30	-				-
Tamarindo	-	10	10				10
Tatajuba	1.4	241	132				132
Teak	12.9	1285	743				743
Tento Amarelo	-	72	42				42

Table F-3--continued

Crop Name	Original Planting area (ha)	# planted	# present	Replanting (ha)	#planted	#present	Present Total #
Terminalia	-	-	10				10
Ucuuba	1	242	211				211
Urucu							-
Uxi	-	9	42				42
Vanilla	1.3	800	845				845
unidentified fruit	-	2	2				2
unidentified tree	-	3	3				3
other trees	-	-	30				30
Sub Total	1908.4	504892	397995	126.7	8231	7866	405861
Tree Garden	0.7						
Total	1909.1						
multiplication*	-351.4	(*area counted more than once due to multiple association)					
Adjusted Total	1557.7						

Table F-4. Associate crop older than base crop (due to partial planting, thinning, crop failure, and old remnants)

Associate Crop	Year	Area	Numb. Planted	Numb. Present	Intercropped in	Farm
Acerola	1990	0.4	250	250	Soursop 1993	Noguchi
Acerola	1992	0.8	300	300	Soursop 1996	Endō, K.
Acerola	1993	0.1	60	50	Black Pepper 1996	ASFATA
Acerola	1993	0.8	500	500	Passionfruit 1994	Shioya
Andiroba	1977	-	-	6	Cacao 1978-82	Takaki, Seigo
Andiroba	1981	-	-	38	Cupuaçu 1986-87	Futatsumori
Andiroba	1986	-	15	10	Acerola 1991	Furumoto
Araça Boi	1993	0.2	200	200	Black Pepper 1994	Maki
Bacuri	1971	-	10	10	Açai 1976	Tanisue
Bacuri	1976	-	-	13	Passionfruit 1995	Sasahara
Bacuri	1980-85	1.1	-	10	Rubber Tree 1987	Sasahara
Black Pepper	1991	0.7	1400	1000	Cupuaçu 1993	Takahara
Brazilnut	1932	-	-	2	Açai ?	Wada, C.H.
Brazilnut	1932	-	-	7	Cacao 1978	Takada, M.
Brazilnut	1967	2	-	50	Cacao 1970	Shioya
Brazilnut	1973	-	2	2	Cacao 1974-75	Onuki
Brazilnut	1973	-	1	1	Coffee 1974	Onuki
Brazilnut	1973	-	5	5	Passionfruit 1996	Onuki
Brazilnut	1974	2	63	39	Cacao 1976	Matsuzaki,Y.
Brazilnut	1984	-	-	20	Cupuaçu 1985	Kawamura
Brazilnut	1989	5	-	15	Cashew 1991	Hoshino
Brazilnut	1973	-	-	5	Black Pepper 1991	Sasahara
Brazilnut	1973	1.1	30	24	Cacao 1980	Sasahara
Brazilnut	1975	10	-	250	Cacao 1976-79	Hanawa, H.
Brazilnut	1975	10	-	250	Cacao 1976-79	Hanawa, H.
Brazilnut	1976	-	-	6	Cacao 1981	Niwa
Brazilnut	1978	3	50	40	Passionfruit 1995	Takahashi, J.
Brazilnut	1991	1.9	42	40	Cupuaçu 1992	Miyagawa,M.
Cacao	1981	-	-	50	Mangosteen 1985-87	Takahashi, J.
Carambola	1992	0.2	-	50	Black Pepper 1994	Maki
Cedro	1976	-	-	20	Cacao 1983	Nobayashi, S.
Cedro	1981	1.1	205	200	Rubber Tree 1987	Sasahara
Cedro	1976-79	-	-	20	Cupuaçu 1977	Maki
Cedro Branco	1976	0.3	112	90	Cacao 1978-82	Takaki, Seigo
Cumaru	1964	1	-	250	Cacao 1970	Sakaguchi
Cupuaçu	1994	2	540	430	Passionfruit 1995	Miyagawa,M.
Cupuaçu	1994	1	243	23	Passionfruit 1995	Nagai, T.
Cupuaçu	1994	0.5	120	118	Passionfruit 1996	Tokumaru
Cupuaçu	1994	0.4	-	200	Passionfruit 1996	Inomata
Cupuaçu	1990	2	700	600	Passionfruit 1995	Kaiya
Cupuaçu	1992	2	800	500	Black Pepper 1993	Takahara
Cupuaçu	1994	9	2320	230	Passionfruit 1995	Nagai, T.

Table F-4--continued

Associate Crop	Year	Area	Numb. Planted	Numb. Present	Intercropped in	Farm
Freijó	1974	4.5	2700	675	Cupuaçu 1977	Maki
Freijó	1976	0.3	-	50	Cacao 1978-82	Takaki, Seigo
Freijó	1974	-	-	12	Passionfruit 1996	Onuki
Freijó	1975	4.5	4800	3840	Cupuaçu 1993	Maki
Freijó	1976	-	-	10	Cacao 1983	Nobayashi, S.
Freijó	1976	5	2500	850	Pasture 1995	Onuki
Freijó	1980	-	-	4	Passionfruit 1996	Saiki
Freijó	1989-90	1.2	360	288	Cupuaçu 1990	Onuki
Gmelina	1966	-	6	6	Cacao 1972	Sakaguchi
Ipê	1974	-	7	5	Cacao 1976	Matsuzaki,Y.
Ipê (roxo serrado)	1993	0.8	20	20	Acerola 1994	Matsunaga,T.
Mammee Apple	1991	-	16	15	Acerola 1992	Miyagawa,M.
Mango	1984	7	400	200	Oil Palm 1986	Shinomiya,M
Mango	1993	0.3	198	168	Black Pepper 1994	Maki
Mangosteen	1990	0.1	100	50	Cupuaçu 1994	Umezawa
Mangosteen	1993	0.2	120	120	Cupuaçu 1994	Itō, T.
Mangosteen	1991	-	80	72	Acerola 1992	Miyagawa,M.
Marupá	1977	-	1	1	Mangosteen 1989	Onuki
Puxuri	1978	-	40	20	Mangosteen 1992	Takahashi, J.
Puxuri	1970	0.2	120	50	Cacao 1972	Wada, C.H.
Rambutan	1984	-	10	10	Rubber Tree 1988	Miyagawa,M.
Rubber Tree	1974	2.1	1240	150	Cacao 1976	Ōta, S.
Rubber Tree	1975	1	70	35	Cacao 1985	Sasaki,Yukio
Rubber Tree	1984	5.5	2040	1430	Cupuaçu 1986	Nagai, T.
Rubber Tree	1986	1.5	500	500	Açai 1993	Nambu
Rubber Tree	1987	1.8	750	370	Cupuaçu 1988	Maki
Rubber Tree	1988	-	-	20	Passionfruit 1996	Endō, J.
Rubber Tree	1990	5	1000	650	Cacao 1991	Yoshimura,F.
Rubber Tree	1966	0.5	100	100	Cacao 1974	Tanizawa
Rubber Tree	1972	1	500	90	Cacao 1976	Ōta, S.
Rubber Tree	1988	1	-	30	Cacao 1989	Furumoto
Soursop	1992	0.2	-	30	Black Pepper 1994	Maki
Soursop	1993	0.2	60	60	Black Pepper 1995	Maeda
Sweet Oranges	1990	-	10	10	Soursop 1992	Kuroki, S.
Sweet Oranges	1991	0.5	100	80	Passionfruit 1995	Kondō
Total (77 entries)		103	25816	15945		

Table F-5. Total area by crop and number of plants present (polycultures include intercropped (Table F-2) and associate (Table F-3) crops)

Crop Name	monocul-ture (ha)	policul-ture (ha)	Total Area(ha)	# mono-culture	# poli-culture	Present Total #
Acacia	-	-	-	-	8	8
Açai Palm	79.3	65.3	144.6	48152	23581	71733
Acapu	-	-	-	-	35	35
Acerola	111.6	55.3	166.9	41852	22055	63907
Ameixa	-	-	-	-	2	2
Andiroba	17.1	117.2	134.3	6932	14725	21657
Araça Boi	-	2.4	2.4	-	690	690
Araça Costa Rica	-	0.4	0.4	-	132	132
Araça Pera	2.2	2.8	5	602	916	1518
Avocado	13.9	35.7	49.6	1239	2684	3923
Bacabi Palm	1.4	1.5	2.9	440	200	640
Bacuri	-	20.7	20.7	-	447	447
Bamboo	0.2	0.2	0.4	-	-	-
Banana	4.6	3.8	8.4	500	620	1120
Baru	-	-	-	-	106	106
Biribá	-	-	-	-	20	20
Black Pepper	590.4	371.3	961.7	637291	317762	955053

Table F-5--continued

Crop Name	monoculture (ha)	policulture (ha)	**Total Area(ha)**	mono-culture #	poli-culture #	**Present Total #**
Brazilnut	25.8	129.7	155.5	586	5062	5648
Breadfruit	-	1.1	1.1	-	83	83
Cacao	1210	1083.5	2293.5	734170	567309	1301479
Caja / Tapereba	-	0.5	0.5	-	57	57
Camu Camu	0.1	9.3	9.4	80	4988	5068
Candlenut	-	-	-	-	55	55
Carambola	1.2	9.4	10.6	170	1889	2059
Cashew	7.9	19.2	27.1	2382	2639	5021
Cassava	8.9	1.5	10.4	-	-	-
Cedro	-	13.9	13.9	-	879	879
Cedro Branco	-	0.5	0.5	-	188	188
Coconut	25	6.4	31.4	5035	1050	6085
Coffee	3.1	21.1	24.2	1126	9750	10876
Comiquie	-	1.5	1.5	-	10	10
Copaiba	-	-	-	-	100	100
Cuiarana	-	-	-	-	62	62
Cumaru	0.2	1	1.2	30	290	320
Cupuaçu	436.3	705.4	1141.7	129339	183065	312404
Custard Apple	-	1.1	1.1	-	385	385
Cutite	-	-	-	-	7	7
Eucalyptus	-	-	-	-	11	11
Fava Maputigui	-	-	-	-	18	18
Feijão Bean	0.8	-	0.8	-	-	-
Freijó	15.7	162.5	178.2	2650	30423	33073
Genipa Fruit	-	-	-	-	15	15
Gmelina	-	40.9	40.9	-	1800	1800
Guarana	0.3	7.5	7.8	100	1090	1190
Guarana de Caroço	-	-	-	-	5	5
Guava	1.3	5.4	6.7	381	1832	2213
Guinea Chestnut	1.5	1	2.5	100	60	160
Ipê (*Tabebuia* spp.)	1.3	16.4	17.7	633	3388	4021
Jaboticaba	0.1	-	0.1	60	113	173
Jacaranda da Bahia	-	-	-	-	63	63
Jacaranda do Pará	-	1	1	-	397	397
Jackfruit	-	6.4	6.4	-	707	707
Jatobá	-	-	-	-	2	2
Jutaí Açu	-	-	-	-	49	49
Jutaí Mirim	-	-	-	-	60	60
Laiti	-	-	-	-	2	2
Leucaena	-	2	2	-	586	586
Lime	2.6	2.1	4.7	608	261	869
Louro Vermelho	-	-	-	-	2	2
Macacauba	-	22.6	22.6	-	1252	1252
Mahogany	3.9	84.7	88.6	1220	7664	8884
Mammee Apple	-	2.9	2.9	-	1097	1097
Mandarin Oranges	1	1.8	2.8	346	178	524
Mango	8.5	15.8	24.3	613	647	1260
Mangosteen	3.8	8.8	12.6	600	1619	2219
Marang	-	3.2	3.2	-	520	520
Marupá	-	-	-	-	2	2
Morototo	-	-	-	-	5	5
Mucuna Preta	4	-	4	-	-	-
Muruci	-	2.5	2.5	-	670	670
Neem	-	-	-	-	8	8
Nutmeg	0.6	-	0.6	150	26	176
Oil Palm	563.6	20.2	583.8	78833	3020	81853
Papaya	0.5	1.4	1.9	300	575	875
Paradise Nut	-	0.4	0.4	-	27	27
Parapara	0.6	-	0.6	300	2	302
Paricá	1.7	14.5	16.2	395	983	1378
Passionfruit	177.2	234.6	411.8	95864	97827	193691
Pasture Grasses	20639.7	22.3	20662	-	-	-
Mangosteen	3.8	8.8	12.6	600	1619	2219

Table F-5--continued

Crop Name	monoculture (ha)	policulture (ha)	**Total Area(ha)**	monoculture #	policulture #	**Present Total #**
Marang	-	3.2	3.2	-	520	520
Marupá	-	-	-	-	2	2
Morototo	-	-	-	-	5	5
Mucuna Preta	4	-	4	-	-	-
Muruci	-	2.5	2.5	-	670	670
Neem	-	-	-	-	8	8
Nutmeg	0.6	-	0.6	150	26	176
Oil Palm	563.6	20.2	583.8	78833	3020	81853
Papaya	0.5	1.4	1.9	300	575	875
Paradise Nut	-	0.4	0.4	-	27	27
Parapara	0.6	-	0.6	300	2	302
Paricá	1.7	14.5	16.2	395	983	1378
Passionfruit	177.2	234.6	411.8	95864	97827	193691
Pasture Grasses	20639.7	22.3	20662	-	-	-
Pau Brasil Falso	-	-	-	-	4	4
Pau Ferro	-	-	-	-	1	1
Pau Rosa	-	-	-	-	14	14
Peach Palm	21.1	4	25.1	51161	14543	65704
Pine	-	-	-	-	11	11
Pineapple	7.7	0.6	8.3	78870	2810	81680
Piquiá	0.5	0.5	1	50	41	91
Piquiarana	-	-	-	-	1	1
Pitomba	-	-	-	-	1	1
Puxuri	4.5	4.1	8.6	690	281	971
Rambutam	1.1	0.9	2	240	152	392
Rubber Tree	544.6	537.7	1082.3	165825	108398	274223
Sabiá	0.2	-	0.2	120	20	140
Sapodilla	-	2.5	2.5	-	341	341
Sapota de Solimões	-	-	-	-	2	2
Sassafras	-	-	-	-	10	10
Sendan	-	-	-	-	5	5
Shadock	-	-	-	-	10	10
Soursop	74.4	105.3	179.7	22627	25372	47999
Sucupira	-	-	-	-	20	20
Sumauma	-	0.5	0.5	-	70	70
Sweet Oranges	3.3	4.1	7.4	1063	484	1547
Tachi Preto	-	-	-	-	-	-
Tamarindo	-	-	-	-	10	10
Tatajuba	-	1.4	1.4	-	132	132
Teak	1.9	13.3	15.2	2238	1053	3291
Tento Amarelo	-	-	-	-	42	42
Terminalia	-	-	-	-	10	10
Ucuuba	-	1	1	-	211	211
Urucu	36	-	36	16900	-	16900
Uxi	-	-	-	-	42	42
Vanilla	0.1	1.3	1.4	300	845	1145
unidentified fruit	-	-	-	-	2	2
unidentified tree	-	-	-	-	3	3
other trees	-	-	-	-	30	30
Sub Total	24688.3	4039.8	28728.1	2133163	1473828	3606991
Reservoir	28.5		28.5			
Fruit Orchard		10.9	10.9			
Tree Garden		1.1	1.1			
Vegetable Field		4.2	4.2			
Homegarden		344.8	344.8			
Public Facilities		35.5	35.5			
Total	24691.8	4436.3	29128.1			

APPENDIX G
INTERCROPPING COMBINATIONS ON
JAPANESE-BRAZILIAN FARMS AT TOMÉ-AÇU (1996)

Base Crop	Area (ha)	Number Present	Associate Crop	Simple Assoc. (ha)	Simple Assoc. # present	Multiple Assoc. (ha)	Multiple Assoc. # present
Açai Palm	16.1	4405	Bacabi Palm	-	-	1.5	200
			Bacuri	-	-	-	10
			Brazilnut	-	16	-	10
			Cupuaçu	5	808	-	-
			Jaboticaba	-	-	-	3
			Macacauba	0.3	43	-	-
			Muruci	-	-	-	20
			Rubber Tree	1.5	500	-	-
			unidentified fruit	-	-	-	2
Acerola	31.9	13193	Andiroba	-	10	-	-
			Araça Boi	-	-	-	10
			Araça Pera	1	120	-	-
			Avocado	1	63	1.3	120
			Black Pepper	0.5	500	1	500
			Caja / Tapereba	-	-	-	3
			Camu Camu	1	50	-	10
			Carambola	-	-	-	19
			Coconut	-	-	1.5	200
			Cupuaçu	-	-	2.7	810
			Guava	-	-	-	10
			Ipê	0.8	20	-	-
			Mammee Apple	0.5	100	1	645
			Mango	-	-	1.5	12
			Mangosteen	-	-	-	72
			Marang	-	-	-	2
			Neem	-	8	-	-
			Passionfruit	3.2	856	10.3	2950
			Peach Palm	-	-	-	33
			Rambutan	-	-	-	10
			Sapodilla	-	-	-	44
			Soursop	0.2	10	10.5	2408
			Sweet Oranges	-	-	1.5	40
			Uxi	-	-	-	8
Andiroba	6.4	2240	Cacao	3.5	200	-	-
			Cupuaçu	0.9	370	-	-
			Freijó	1	120	1	170
			Ipê	-	-	1	140
			Mahogany	-	-	1	135
Araça Pera	0.6	160	Passionfruit	0.6	280	-	-
Avocado	7.4	566	Mammee Apple	-	140	-	-
			Soursop	2	525	-	-
Banana	3.8	555	Breadfruit	-	-	1.1	83
			Cassava	1.5	-	-	-
			Coconut	0.4	75	0.4	75
			Jackfruit	-	-	0.4	75

Appendix G--continued

Base Crop	Area (ha)	Number Present	Associate Crop	Simple Assoc. (ha) # present		Multiple Assoc. (ha) # present	
Banana (cont.)			Peach Palm	-	-	-	100
			Soursop	-	-	0.8	150
Black Pepper	354.8	306967	Açai	6.4	2365	-	-
			Acerola	2.1	835	3.3	800
			Andiroba	-	-	1	100
			Araça Boi	0.2	80	2.2	600
			Araça Pera	0.1	40	-	70
			Avocado	1.4	187	6.9	600
			Bacuri	-	60	2	100
			Biribá	-	-	-	20
			Brazilnut	13.2	640	-	75
			Cacao	6.5	1000	-	-
			Camu Camu	0.6	460	0.4	118
			Carambola	0.8	240	0.7	300
			Cashew	10.5	1550	1	167
			Coconut	0.7	99	0.2	33
			Cupuaçu	170.4	54056	31.1	7323
			Guaraná de Caroço	-	-	-	5
			Guava	1.9	960	-	-
			Ipê	0.8	300	3	732
			Jacaranda do Pará	-	-	1	140
			Jutaí Mirim	-	-	-	10
			Leucaena	-	-	-	10
			Mahogany	-	3	2.1	138
			Mango	-	-	0.3	198
			Muruci	1.5	600	1	40
			Passionfruit	36.7	15322	2.5	1610
			Pasture Grasses	0.8	-	-	-
			Peach Palm	4	14400	-	-
			Pineapple	0.4	600	-	-
			Puxuri	-	16	-	5
			Rambutan	0.2	38	0.2	33
			Sapodilla	-	-	-	10
			Sapota de Solimões	-	-	-	2
			Soursop	17	5060	9.8	2735
			Teak	2.5	200	9	300
			Tento Amarelo	-	-	-	10
			other trees	-	-	-	30
			(mixed MPTs)	-	-	0.7	*tot.150*
Brazilnut	19.5	768	Cacao	14	6300	-	-
			Cedro	-	-	1	29
			Cupuaçu	3.4	1042	-	-
			Freijó	-	-	1	29
			Mahogany	-	-	1	61
Cacao	917.7	515596	Açai	3	600	23	7780
			Acapu	-	-	-	35
			Acerola	0.2	45	-	-
			Andiroba	37.3	4395	65.5	6418
			Avocado	7	195	-	-
			Bacuri	2.1	3	15.5	137
			Brazilnut	27.5	659	27.2	553
			Caja / Tapereba	-	-	-	31
			Candlenut	-	-	-	50
			Cedro	-	18	9.8	331
			Cedro Branco	-	-	0.5	111
			Coffce	2.5	600	17	9000
			Cumaru	-	5	1	260
			Cupuaçu	19.1	5114	22.6	4940
			Freijó	43.8	7800	58	9509

Appendix G--continued

Base Crop	Area (ha)	Number Present	Associate Crop	Simple Assoc. (ha)	# present	Multiple Assoc. (ha)	# present
Cacao (cont.)			Genipa Fruit	-	-	-	2
			Gmelina	21.7	1066	19.2	732
			Guarana	4	500	1.9	240
			Guinea Chestnut	-	10	-	-
			Ipê	-	-	-	102
			Jackfruit	-	-	5.6	592
			Macacauba	-	-	9.8	663
			Mahogany	4.2	1007	39.3	1241
			Mandarin Oranges	-	-	-	10
			Mangosteen	0.8	111	1	90
			Morototo	-	-	-	2
			Paricá	7.5	320	2	43
			Passionfruit	-	-	8	1300
			Pasture Grasses	-	-	5	-
			Pine	-	-	-	1
			Piquiá	-	-	-	16
			Puxuri	-	-	0.2	50
			Rubber Tree	138.7	16010	73.9	8810
			Sapodilla	-	-	-	20
			Soursop	0.3	50	-	-
			Sucupira	-	-	-	20
			Sumauma	-	-	0.5	70
			Tatajuba	-	-	1.4	110
			Teak	-	30	-	-
			Terminalia	-	-	-	10
			Ucuuba	1	190	-	11
			Uxi	-	-	-	1
			Vanilla	-	-	0.5	180
			Shadock	-	-	-	10
Camu Camu	2	900	Passionfruit	2	1200	-	-
Cashew	5.5	420	Brazilnut	5	15	-	-
			Lime	-	-	0.5	6
			Mandarin Oranges	-	-	1	20
			Sapodilla	-	-	0.5	15
			Sweet Oranges	-	-	1	20
Cedro	0.6	55	Avocado	-	-	0.6	10
			Cupuaçu	-	-	0.6	120
Coconut	2.4	395	Cashew	0.4	95	-	-
			Cupuaçu	-	-	1.5	210
			Pineapple	0.2	2000	-	-
			Soursop	-	-	1.5	300
Coffee	0.5	-	Brazilnut	-	-	-	1
			Cedro	-	-	-	1
			Freijó	-	-	0.5	251
			Louro Vermelho	-	-	-	2
			Macacauba	-	-	0.5	7
Comiquie	1.5	10	Mango Bacri	-	-	1.5	10
			Mango Rosa	-	-	1.5	10
			Mango Peito de Pomba	-	-	1.5	10
Cupuaçu	249.4	70625	Açai	5.5	1450	1	310
			Acerola	-	-	8.4	2450
			Andiroba	2	98	-	-
			Avocado	1	45	-	10
			Banana	-	-	-	5
			Black Pepper	3.3	3000	-	-
			Brazilnut	16.2	771	-	70

Appendix G--continued

Base Crop	Area (ha)	Number Present	Associate Crop	Simple Assoc. (ha)	Simple Assoc. # present	Multiple Assoc. (ha)	Multiple Assoc. # present
Cupuaçu (cont.)			Caja / Tapereba	-	10	-	-
			Camu Camu	-	-	5.3	3450
			Carambola	2	200	0.6	90
			Cedro	-	-	-	25
			Copaiba	-	-	-	100
			Freijó	3.2	608	13.2	5135
			Guarana	1.6	340	-	-
			Guinea Chestnut	1	50	-	-
			Ipê	2.5	305	5	240
			Jacaranda do Pará	-	-	-	7
			Jackfruit	-	-	0.4	38
			Leucaena	-	-	2	336
			Macacauba	-	-	9	470
			Mahogany	1.2	235	10	477
			Mammee Apple	-	-	1	160
			Mangosteen	0.1	50	0.2	128
			Marupá	-	-	-	1
			Paricá	-	-	-	7
			Passionfruit	41.5	15800	0.4	300
			Pasture Grasses	-	-	4.5	-
			Piquiá	-	-	-	3
			Rubber Tree	15.1	3150	12.5	1660
			Sapodilla	-	-	-	6
			Soursop	24.9	3830	2.2	200
			Sweet Oranges	-	-	-	10
			Uxi	-	-	-	4
Custard Apple	1.1	315	Brazilnut	-	-	-	15
			Sapodilla	-	-	0.4	135
			Soursop	-	-	0.7	255
Freijó	16.3	4072	Andiroba	2	600	3	700
			Caja / Tapereba	-	-	0.5	10
			Cedro	-	-	-	10
			Cupuaçu	1.5	450	3	100
			Cutite	-	-	-	5
			Guarana	-	-	-	10
			Jacaranda da Bahia	-	27	-	-
			Macacauba	-	-	3	60
			Mahogany	-	-	0.5	15
			Mandarin Oranges	-	-	-	8
			Mango	0.3	18	-	-
			Piquiá	-	-	0.5	10
			Tamarindo	-	-	-	10
Guava	0.7	100	Sapodilla	0.7	50	-	-
Lime	1.2	195	Cupuaçu	1.2	175	-	-
Mahogany	1.5	333	Cedro Branco	-	-	-	27
			Ipê	-	-	1.5	376
			Jacaranda do Pará	-	-	-	98
Mandarin Oranges	0.3	50	Avocado	-	9	-	-
			Sweet Oranges	0.1	10	-	-
Mango	1.6	130	Coconut	0.8	100	-	-
			Cupuaçu	0.8	80	-	-
Mangosteen	6.2	1083	Acerola	0.7	685	-	-
			Avocado	-	-	-	5
			Cacao	-	-	-	50
			Cedro	-	17	-	-

Appendix G--continued

Base Crop	Area (ha)	Number Present	Associate Crop	Simple Assoc. (ha)	Simple Assoc. # present	Multiple Assoc. (ha)	Multiple Assoc. # present
Mangosteen (cont.)			Cupuaçu	-	-	0.5	155
			Mahogany	-	-	-	21
			Mammee Apple	-	-	-	2
			Marupá	-	-	-	1
			Puxuri	2.1	40	-	20
			Rambutan	-	-	0.5	61
Oil Palm	20.2	3020	Brazilnut	-	100	-	-
			Mango	7	200	-	-
Papaya	1.4	547	Acerola	-	-	0.8	400
			Araça Pera	0.1	30	-	-
			Avocado	-	-	0.5	56
			Passionfruit	-	-	0.5	316
			Puxuri	-	-	0.8	100
Paricá	5	500	Cacao	5	1800	-	-
Passionfruit	125.8	57073	Açai	-	-	2	536
			Acerola	1	309	1.8	700
			Araça Pera	0.7	300	0.3	140
			Avocado	8.6	600	-	182
			Bacuri	-	-	-	13
			Black Pepper	3.5	3250	2.8	2010
			Brazilnut	3	40	-	5
			Cacao	0.5	350	5	1000
			Carambola	2.8	1000	-	-
			Cashew	0.6	200	-	-
			Cupuaçu	56.2	11438	3	735
			Freijó	-	4	-	12
			Guava	1	300	-	-
			Ipê	-	-	-	2
			Mahogany	-	-	-	20
			Marang	-	-	2.8	455
			Pineapple	-	-	-	150
			Rubber Tree	-	20	-	-
			Soursop	7.8	2940	7.7	1602
			Sweet Oranges	0.5	80	0.2	77
			Uxi	-	-	-	20
Pasture Grasses	10.3	-	Andiroba	-	34	-	-
			Baru	-	106	-	-
			Cuiarana	-	62	-	-
			Cumaru	-	25	-	-
			Fava Maputigui	-	18	-	-
			Freijó	5	889	-	-
			Ipê	-	291	-	-
			Jacaranda do Pará	-	152	-	-
			Jutaí Açu	-	49	-	-
			Jutaí Mirim	-	50	-	-
			Leucaena	-	240	-	-
			Mahogany	-	182	-	-
			Morototo	-	1	-	-
			Tatajuba	-	22	-	-
			Teak	-	35	-	-
			Tento Amarelo	-	32	-	-
Puxuri	1	50	Carambola	-	-	1	10
			Soursop	-	-	1	150
Rubber Tree	296	78182	Açai	7.8	5900	-	-
			Acerola	1	500	-	-
			Andiroba	-	-	-	50

Appendix G--continued

Base Crop	Area (ha)	Number Present	Associate Crop	Simple Assoc. (ha)	# present	Multiple Assoc. (ha)	# present
Rubber Tree (cont.)			Bacuri	-	-	1.1	110
			Black Pepper	-	-	4	450
			Brazilnut	-	-	18.1	1122
			Cacao	80.7	24240	50.6	16773
			Cashew	-	-	1.2	190
			Cedro	-	-	2.5	340
			Cedro Branco	-	-	-	50
			Coffee	-	-	1.1	150
			Cupuaçu	111.2	20186	16.1	3018
			Freijó	-	-	19.5	1670
			Ipê	-	60	1.4	360
			Lime	0.4	30	-	-
			Macacauba	-	-	-	1
			Mahogany	-	-	23.9	3608
			Passionfruit	1.2	500	-	-
			Rambutan	-	-	-	10
			Teak	-	-	1.4	120
			Vanilla	-	-	0.8	665
Sapodilla	0.9	36	Cupuaçu	-	-	-	20
			Custard Apple	-	-	-	20
			Mammee Apple	-	-	0.4	42
			Mangosteen	-	-	-	7
			Paradise Nut	-	-	0.4	26
			Soursop	-	-	-	35
Soursop	18.9	5042	Açai	0.5	235	-	-
			Acerola	4.1	1870	-	-
			Araça Costa Rica	0.4	132	-	-
			Araça Pera	-	45	-	-
			Black Pepper	-	-	1.4	1085
			Carambola	-	-	1.5	30
			Cupuaçu	4.2	990	1	300
			Guava	1.5	400	-	-
			Mandarin Oranges	0.5	90	-	-
			Mango	0.6	25	-	-
			Marang	-	3	0.4	60
			Passionfruit	-	-	1.9	320
			Sweet Oranges	-	-	-	20
Sweet Oranges	0.8	74	Guava	0.3	12	-	-
			Mangosteen	0.5	70	-	-
Teak	0.4	310	Ipê	0.4	140	-	-

<Multiple Associations>

Base Crop / Area (ha)	Associate Crop	Associate Crop	Associate Crop	Associate Crop	Associate Crop
Açai Palm					
1.5	Bacabi Palm	Bacuri	Brazilnut	Jaboticaba	Muruci
(cont.)	unidentified fruit				
Acerola					
-	Araça Boi	Camu Camu	Cupuaçu	Guava	Marang
(cont.)	Rambutam	Tapereba			
1.3	Avocado	Passionfruit			
1	Black Pepper	Mammee Apple			
-	Carambola	Mammee Ap.	Mangosteen	Peach Palm	Sapodilla
	Uxi				
1.5	Coconut	Cupuacu	Mango	Soursop	Sweet Oranges
1.2	Cupuaçu	Peach Palm			
9	Passionfruit	Soursop			

Appendix G--continued

Base Crop / Area (ha)	Associate Crop	Associate Crop	Associate Crop	Associate Crop	Associate Crop
Andiroba					
1	Freijó	Ipê	Mahogany		
Banana					
1.1	Breadfruit	Peach Palm			
0.4	Coconut	Soursop			
0.4	Jackfruit	Soursop			
Black Pepper					
5	Acerola	Camu Camu	Cupuaçu	Soursop	
1	Andiroba	Mahogany			
0.2	Araça Boi	Carambola	Soursop		
2	Araça Boi	Cupuaçu	Puxuri	Sapodilla	
-	Araça Pera	Camu Camu			
1.1	Avocado	Brazilnut			
1.8	Avocado	Passionfruit			
0.4	Avocado	Sapota de Solimões			
3.6	Avocado	Soursop			
2	Bacuri	Cupuaçu	Soursop		
0.3	Biribá	Mango			
0.5	Brazilnut	Carambola			
0.7	Brazilnut	Cupuaçu			
-	Brazilnut	Mahogany			
6	Cashew	Cupuaçu			
1	Cashew	Muruci	Soursop		
0.2	Coconut	Rambutam			
2	Cupuaçu	Ipê			
2.9	Cupuaçu	Mahogany			
5	Cupuaçu	Soursop			
9	Cupuaçu	Teak			
0.7	Guarana Car.	Ipê	Jacaranda Pa.	Jutaí Mirim	Leucaena
(cont.)	Mahogany	Tento Amar.	other trees		
1	Ipê	Jacaranda Pa.	Mahogany		
0.7	Passionfruit	Soursop			
Brazilnut					
1	Cedro	Freijó	Mahogany		
Cacao					
2	Açai	Andiroba			
3.6	Açai	Brazilnut	Jackfruit		
7	Açai	Freijó			
2.7	Açai	Freijó	Rubber Tree		
2	Açai	Mangosteen			
10	Açai	Rubber Tree			
3	Acapu	Gmelina			
2	Andiroba	Brazilnut			
7.6	Andiroba	Brazilnut	Cedro	Freijó	Macacauba
(cont.)	Mahogany	Rubber Tree			
15	Andiroba	Brazilnut	Cedro Branco	Freijó	Mahogany
2.8	Andiroba	Brazilnut	Freijó	Macacauba	Mahogany
1.4	Andiroba	Brazilnut	Jackfruit	Rubber Tree	
-	Andiroba	Cedro	Cedro Branco	Freijó	
1.5	Andiroba	Cedro	Freijó	Macacauba	
0.3	Andiroba	Cedro Branco	Freijó		
2	Andiroba	Coffee			
14	Andiroba	Coffee	Cumaru	Rubber Tree	Sumauma
-	Andiroba	Freijó			
0.8	Andiroba	Freijó	Piquiá	Ucuuba	
15	Andiroba	Gmelina			
0.6	Andiroba	Jackfruit	Rubber Tree		
6	Andiroba	Mangosteen			
11.9	Andiroba	Puxuri			
8	Avocado	Cupuaçu	Passionfruit	Rubber Tree	
14	Bacuri	Brazilnut	Freijó	Ipê	Tatajuba
3.3	Bacuri	Brazilnut	Freijó	Mahogany	
10	Brazilnut	Caja	Freijó	Genipa Fruit	Rubber Tree

Appendix G--continued

Base Crop / Area (ha)	Associate Crop	Associate Crop	Associate Crop	Associate Crop	Associate Crop
Cacao (cont.)					
3	Brazilnut	Cedro	Freijó	Ipê	
2.3	Brazilnut	Cedro	Gmelina		
5.7	Brazilnut	Cedro	Rubber Tree		
1.1	Brazilnut	Freijó			
16	Brazilnut	Freijó	Ipê	Jackfruit	Macacauba
(cont.)	Mahogany	Morototo	Piquiá	Rubber Tree	Sucupira
(cont.)	Ucuuba	Uxi			
2	Brazilnut	Genipa Fruit	Mahogany		
2.2	Brazilnut	Mahogany			
5.4	Cedro	Cupuaçu			
-	Cedro	Freijó			
1	Cedro	Freijó	Ipê	Mahogany	Rubber Tree
1	Cedro	Freijó	Mahogany	Pine	
-	Cedro	Freijó	Piquiá		
-	Cedro	Freijó	Ucuuba		
10	Cedro	Mahogany			
1	Coffee	Freijó			
-	Cumaru	Mahogany			
2.5	Cupuaçu	Brazilnut	Freijó	Tapereba	
-	Cupuaçu	Freijó			
3.7	Cupuaçu	Ipê Serrado			
3	Cupuaçu	Jackfruit	Rubber Tree	Sapodilla	Shaddock
(cont.)	Mandarin Orange				
0.4	Freijó	Guarana			
3	Freijó	Rubber Tree			
1.5	Gmelina	Guarana			
8	Mahogany	Rubber Tree			
2	Paricá	Terminalia			
5	Pasture Grass	Rubber Tree			
6.6	Rubber Tree	Tatajuba			
19	Rubber Tree	Vanilla			
Cashew					
0.5	Lime	Mandarin Or.	Sapodilla	Sweet Oranges	
Cedro					
0.6	Avocado	Cupuaçu			
Coconut					
1.5	Cupuaçu	Soursop			
Coffee					
0.5	Brazilnut	Cedro	Freijó	Louro Verm.	Macacauba
Comiquie					
1.5	Mango Bacri / Rosa / Peito de Pomba				
Cupuaçu					
2.2	Açai	Avocado	Banana	Mammee Ap.	Mangosteen
(cont.)	Sapodilla	Soursop	Sweet Oranges		
1	Açai	Freijó			
5.3	Acerola	Camu Camu			
0.6	Acerola	Carambola			
4.8	Acerola	Mangosteen			
3.2	Brazilnut	Freijó			
-	Brazilnut	Mahogany			
2	Copaiba	Rubber Tree			
4.5	Cedro	Freijó	Macacauba	Mahogany	Marupá
(cont.)	Paricá	Piquiá	Uxi		
4.5	Freijó	Macacauba			
5	Ipê	Jacaranda Pa.	Leucaena	Mahogany	
5	Ipê	Mahogany	Rubber Tree		
0.4	Jackfruit	Passionfruit			
1	Mammee Ap.	Rubber Tree			
4.5	Pasture Grass	Rubber Tree			
Custard Apple					
0.3	Brazilnut	Soursop			
0.4	Sapodilla	Soursop			

Appendix G--continued

Base Crop / Area (ha)	Associate Crop	Associate Crop	Associate Crop	Associate Crop	Associate Crop
Freijó					
3	Andiroba	Cedro	Cupuaçu	Macacauba	
0.5	Cajarana	Cutite	Guarana	Mahogany	Mandarin Or.
(cont.)	Piquiá	Tamarindo			
Mahogany					
1.5	Cedro Branc.	Ipê	Jacaranda Pa.		
Mangosteen					
-	Avocado	Cacao	Cupuaçu	Mahogany	Mammee Ap.
(cont.)	Rambutan				
0.5	Cupuaçu	Puxuri	Rambutan		
-	Mahogany	Marupá			
Papaya					
0.8	Acerola	Puxuri			
0.5	Avocado	Passionfruit			
Passionfruit					
1	Açai	Cupuaçu			
1	Açai	Cupuaçu	Soursop		
1	Acerola	Soursop			
0.8	Acerola	Sweet Oranges			
0.3	Araça Pera	Pineapple	Soursop		
-	Avocado	Bacuri	Ipê	Uxi	
4.5	Avocado	Soursop			
2.8	Black Pepper	Marang			
-	Brazilnut	Freijó			
5	Cacao	Mahogany			
1	Cupuaçu	Soursop			
Puxuri					
1	Carambola	Soursop			
Rubber Tree					
8.5	Andiroba	Bacuri	Brazilnut	Cacao	Cedro Branco
(cont.)	Coffee	Cupuaçu	Freijó		
1.1	Bacuri	Cedro	Mahogany		
4	Black Pepper	Cupuaçu			
1.4	Brazilnut	Cacao			
9.6	Cacao	Brazilnut	Freijó		
6	Cacao	Cedro			
0.1	Cacao	Coffee			
4.6	Cacao	Cupuaçu			
1.3	Cacao	Freijó			
2.8	Cacao	Ipê	Mahogany		
0.5	Cacao	Macacauba			
16.8	Cacao	Mahogany			
1.2	Cashew	Rambutam			
1.4	Cedro	Freijó	Ipê	Mahogany	Teak
1	Cupuaçu	Vanilla			
1.8	Ipê	Mahogany			
Sapodilla					
-	Custard Appl	Cupuaçu	Mammee Ap.	Mangosteen	Soursop
0.4	Mammee Ap.	Sapucaia			
Soursop					
1	Black Pepper	Cupuaçu			
0.4	Black Pepper	Marang	Passionfruit		
1.5	Carambola	Passionfruit	Sweet Oranges		

Note: Multiple associations lacking a base crop, that belong to 'Fruit Orchard 10.9 ha' in Table F-2 of Appendix F), are not included.

APPENDIX H
TYPES OF AGROFORESTRY ON JAPANESE-BRAZILIAN FARMS
AT TOMÉ-AÇU IN 1996

1) Fruit Orchard Type: 590.3 ha
Table H-1. Fruit Orchard Simple Association

Area	Crop	Crop	Area	Crop	Crop
6.4	Açai Palm	Black Pepper	-	Black Pepper	Puxuri
3	Açai Palm	Cacao	0.2	Black Pepper	Rambutan
10.5	Açai Palm	Cupuaçu	17	Black Pepper	Soursop
0.5	Açai Palm	Soursop	19.1	Cacao	Cupuaçu
1	Acerola	Araça Pera	4	Cacao	Guarana
1	Acerola	Avocado	-	Cacao	Guinea Chestnut
2.6	Acerola	Black Pepper	0.8	Cacao	Mangosteen
0.2	Acerola	Cacao	0.5	Cacao	Passionfruit
1	Acerola	Camu Camu	0.3	Cacao	Soursop
0.5	Acerola	Mammee Apple	-	Caja / Tapereba	Cupuaçu
0.7	Acerola	Mangosteen	2	Camu Camu	Passionfruit
4.2	Acerola	Passionfruit	2	Carambola	Cupuaçu
4.3	Acerola	Soursop	2.8	Carambola	Passionfruit
0.2	Araça Boi	Black Pepper	0.4	Cashew	Coconut
0.4	Araça Costa Rica	Soursop	0.6	Cashew	Passionfruit
0.1	Araça Pera	Black Pepper	0.2	Coconut	Pineapple
0.1	Araça Pera	Papaya	0.8	Coconut	Mango
1.3	Araça Pera	Passionfruit	1.6	Cupuaçu	Guarana
-	Araça Pera	Soursop	1	Cupuaçu	Guinea Chestnut
1.4	Avocado	Black Pepper	1.2	Cupuaçu	Lime
7	Avocado	Cacao	0.8	Cupuaçu	Mango
1	Avocado	Cupuaçu	0.1	Cupuaçu	Mangosteen
-	Avocado	Mammee Apple	97.7	Cupuaçu	Passionfruit
-	Avocado	Mandarin Oranges	29.1	Cupuaçu	Soursop
8.6	Avocado	Passionfruit	1	Guava	Passionfruit
2	Avocado	Soursop	0.7	Guava	Sapodilla
1.5	Banana	Cassava	1.5	Guava	Soursop
0.4	Banana	Coconut	0.3	Guava	Sweet Oranges
0.6	Black Pepper	Camu Camu	0.5	Mandarin Oranges	Soursop
0.8	Black Pepper	Carambola	0.1	Mandarin Oranges	Sweet Oranges
10.5	Black Pepper	Cashew	7	Mango	Oil Palm
0.7	Black Pepper	Coconut	0.6	Mango	Soursop
173.7	Black Pepper	Cupuaçu	2.1	Mangosteen	Puxuri
1.9	Black Pepper	Guava	0.5	Mangosteen	Sweet Oranges
1.5	Black Pepper	Muruci	-	Marang	Soursop
40.2	Black Pepper	Passionfruit	7.8	Passionfruit	Soursop
4	Black Pepper	Peach Palm	0.5	Passionfruit	Sweet Oranges
0.4	Black Pepper	Pineapple			

Table H-2. Fruit Orchard Multiple Association

Area	Crop	Crop	Crop	Crop	Crop
2.2	Açai	Avocado	Banana	Cupuaçu	Mammee Apple
cont.	Mangosteen	Sapodilla	Soursop	Sweet Oranges	
2	Açai	Cacao	Mangosteen		
1	Açai	Cupuaçu	Passionfruit		
1	Açai	Cupuaçu	Passionfruit	Soursop	
-	Acerola	Araça Boi	Camu Camu	Cupuaçu	Guava Paulista
cont.	Marang	Rambutam	Tapereba		
1.3	Acerola	Avocado	Passionfruit		
5	Acerola	Black Pepper	Camu Camu	Cupuaçu	Soursop
1	Acerola	Black Pepper	Mammee Apple		
5.3	Acerola	Camu Camu	Cupuaçu		
0.6	Acerola	Carambola	Cupuaçu		
-	Acerola	Carambola	Mammee Apple	Mangosteen	Peach Palm
cont.	Sapodilla	Uxi			
1.5	Acerola	Coconut	Cupuaçu	Mango	Soursop
cont.	Sweet Oranges				
4.8	Acerola	Cupuaçu	Mangosteen		
1.2	Acerola	Cupuaçu	Peach Palm		
0.8	Acerola	Papaya	Puxuri		
10	Acerola	Passionfruit	Soursop		
0.8	Acerola	Passionfruit	Sweet Oranges		
0.2	Araça Boi	Black Pepper	Carambola	Soursop	
2	Araça Boi	Black Pepper	Cupuaçu	Puxuri	Sapodilla
-	Araça Pera	Black Pepper	Camu Camu		
0.2	Araça Pera	Coconut	Sapodilla	Sweet Oranges	
0.3	Araça Pera	Passionfruit	Pineapple	Soursop	
1.8	Avocado	Black Pepper	Passionfruit		
0.4	Avocado	Black Pepper	Sapota de Solimões		
3.6	Avocado	Black Pepper	Soursop		
-	Avocado	Cacao	Cupuaçu	Mahogany	Mammee Apple
cont.	Mangosteen	Rambutan			
8	Avocado	Cacao	Cupuaçu	Passionfruit	Rubber Tree
0.2	Avocado	Cupuaçu	Mammee Apple	Sweet Oranges	
0.5	Avocado	Papaya	Passionfruit		
4.5	Avocado	Passionfruit	Soursop		
2	Bacuri	Black Pepper	Cupuaçu	Soursop	
1.1	Banana	Breadfruit	Peach Palm		
0.4	Banana	Coconut	Soursop		
0.4	Banana	Jackfruit	Soursop		
0.3	Black Pepper	Biribá	Mango		
6	Black Pepper	Cashew	Cupuaçu		
1	Black Pepper	Cashew	Muruci	Soursop	
0.2	Black Pepper	Coconut	Rambutam		
6	Black Pepper	Cupuaçu	Soursop		
2.8	Black Pepper	Marang	Passionfruit		
0.4	Black Pepper	Marang	Passionfruit	Soursop	
0.7	Black Pepper	Passionfruit	Soursop		
1.5	Carambola	Passionfruit	Soursop	Sweet Oranges	
1	Carambola	Puxuri	Soursop		
0.5	Cashew	Lime	Mandarin Oranges	Sapodilla	Sweet Oranges

Table H-2--continued

Area	Crop	Crop	Crop	Crop	Crop
1.5	Cashew	Mango	Mangosteen	Soursop	Sweet Oranges
-	Custard Apple	Cupuaçu	Mammee Apple	Mangosteen	Sapodilla
cont.	Soursop				
0.4	Custard Apple	Sapodilla	Soursop		
1.5	Coconut	Cupuaçu	Soursop		
1.5	Comiquie	Mango Bacri / Rosa / Peito de Pomba			
0.4	Cupuaçu	Jackfruit	Passionfruit		
0.5	Cupuaçu	Mangosteen	Puxuri	Rambutan	
1	Cupuaçu	Passionfruit	Soursop		

2) Fruit Orchard - Timber/Rubber Tree Type: 261.8 ha

Table H-3. Fruit Orchard - Timber/Rubber Tree Simple Association

Area	Crop	Crop	Area	Crop	Crop
-	Açai Palm	Brazilnut	-	Brazilnut	Oil Palm
0.3	Açai Palm	Macacauba	3	Brazilnut	Passionfruit
9.3	Açai Palm	Rubber Tree	-	Cedro	Mangosteen
-	Acerola	Andiroba	4.7	Cupuaçu	Freijó
0.8	Acerola	Ipê	2.5	Cupuaçu	Ipê
-	Acerola	Neem	1.2	Cupuaçu	Mahogany
1	Acerola	Rubber Tree	126.3	Cupuaçu	Rubber Tree
2.9	Andiroba	Cupuaçu	0.3	Freijó	Mango
-	Bacuri	Black Pepper	-	Freijó	Passionfruit
2.1	Bacuri	Cacao	0.4	Lime	Rubber Tree
5	Brazilnut	Cashew	1.2	Passionfruit	Rubber Tree
19.6	Brazilnut	Cupuaçu			

Table H-4. Fruit Orchard - Timber/Rubber Tree Multiple Association

Area	Crop	Crop	Crop	Crop	Crop
1.5	Açai	Bacabi	Bacuri	Brazilnut	Jaboticaba
cont.	Muruci	Unidentified Fruit			
1	Açai	Cupuaçu	Freijó		
1.5	Acerola	Bacuri	Banana	Custard Apple	Cupuaçu
cont.	Jaboticaba	Jacayaca	Limao	Mahogany	Mango
cont.	Soursop	Sweet Oranges			
3	Andiroba	Cedro	Cupuaçu	Freijó	Macacauba
-	Avocado	Bacuri	Ipê	Passionfruit	Uxi
1.1	Avocado	Black Pepper	Brazilnut		
0.6	Avocado	Cedro	Cupuaçu		
1.1	Bacuri	Cedro	Mahogany	Rubber Tree	
0.5	Black Pepper	Brazilnut	Carambola		
0.7	Black Pepper	Brazilnut	Cupuaçu		
2.9	Black Pepper	Cupuaçu	Mahogany		
4	Black Pepper	Cupuaçu	Rubber Tree		
9	Black Pepper	Cupuaçu	Teak		
3.2	Brazilnut	Cupuaçu	Freijó		
-	Brazilnut	Cupuaçu	Mahogany		

Table H-4--continued

Area	Crop	Crop	Crop	Crop	Crop
0.3	Brazilnut	Custard Apple	Soursop		
5.4	Cacao	Cedro	Cupuaçu		
2.5	Cacao	Cupuaçu	Brazilnut	Freijó	Tapereba
-	Cacao	Cupuaçu	Freijó		
3.7	Cacao	Cupuaçu	Ipê Serrado		
3	Cacao	Cupuaçu	Jackfruit	Rubber Tree	Sapodilla
cont.	Shaddock	Unshu Orange			
4.6	Cacao	Cupuaçu	Rubber Tree		
0.5	Cajarana	Cutite	Freijó	Guarana	Mahogany
cont.	Mandarin Orange	Piquiá	Tamarindo		
1.2	Cashew	Rambutam	Rubber Tree		
2	Copaiba	Cupuaçu	Rubber Tree		
2	Cupuaçu	Black Pepper	Ipê		
4.5	Cupuaçu	Cedro	Freijó	Macacauba	Mahogany
cont.	Marupá	Paricá	Piquiá	Uxi	
4.5	Cupuaçu	Freijó	Macacauba		
5	Cupuaçu	Ipê	Jacaranda do Pará	Leucaena	Mahogany
5	Cupuaçu	Ipê	Mahogany	Rubber Tree	
1	Cupuaçu	Mammee Apple	Rubber Tree		
4.5	Cupuaçu	Pasture Grasses	Rubber Tree		
1	Cupuaçu	Rubber Tree	Vanilla		
-	Mahogany	Mangosteen	Marupá		
0.4	Mammee Apple	Sapodilla	Sapucaia		

3) Cacao/Coffee - Timber/Rubber Tree Type: 673.7 ha

Table H-5. Cacao/Coffee - Timber/Rubber Tree Simple Association

Area	Crop	Crop	Area	Crop	Crop
40.8	Andiroba	Cacao	21.7	Cacao	Gmelina
6.5	Black Pepper	Cacao	4.2	Cacao	Mahogany
41.5	Brazilnut	Cacao	12.5	Cacao	Paricá
-	Cacao	Cedro	219.4	Cacao	Rubber Tree
2.5	Cacao	Coffee	-	Cacao	Teak
-	Cacao	Cumaru	1	Cacao	Ucuuba
43.8	Cacao	Freijó			

Table H-6. Cacao/Coffee - Timber/Rubber Tree Multiple Association

Area	Crop	Crop	Crop	Crop	Crop
2	Açai	Andiroba	Cacao		
3.6	Açai	Brazilnut	Cacao	Jackfruit	
7	Açai	Cacao	Freijó		
2.7	Açai	Cacao	Freijó	Rubber Tree	
10	Açai	Cacao	Rubber Tree		
3	Acapu	Cacao	Gmelina		
8.5	Andiroba	Bacuri	Brazilnut	Cacao	Cedro Branco
cont.	Coffee	Cupuaçu	Freijó	Rubber Tree	
2	Andiroba	Brazilnut	Cacao		

Table H-6--continued

Area	Crop	Crop	Crop	Crop	Crop
7.6	Andiroba	Brazilnut	Cacao	Cedro	Freijó
cont.	Macacauba	Mahogany	Rubber Tree		
15	Andiroba	Brazilnut	Cacao	Cedro Branco	Freijó
cont.	Mahogany				
2.8	Andiroba	Brazilnut	Cacao	Freijó	Macacauba
cont.	Mahogany				
1.4	Andiroba	Brazilnut	Cacao	Jackfruit	Rubber Tree
-	Andiroba	Cacao	Cedro	Cedro Branco	Freijó
1.5	Andiroba	Cacao	Cedro	Freijó	Macacauba
0.3	Andiroba	Cacao	Cedro Branco	Freijó	
2	Andiroba	Cacao	Coffee		
14	Andiroba	Cacao	Coffee	Cumaru	Rubber Tree
cont.	Sumauma				
-	Andiroba	Cacao	Freijó		
0.8	Andiroba	Cacao	Freijó	Piquiá	Ucuuba
15	Andiroba	Cacao	Gmelina		
0.6	Andiroba	Cacao	Jackfruit	Rubber Tree	
6	Andiroba	Cacao	Mangosteen		
11.9	Andiroba	Cacao	Puxuri		
14	Bacuri	Brazilnut	Cacao	Freijó	Ipê
cont.	Tatajuba				
3.3	Bacuri	Brazilnut	Cacao	Freijó	Mahogany
10	Brazilnut	Cacao	Caja	Freijó	Genipa Fruit
cont.	Rubber Tree				
3	Brazilnut	Cacao	Cedro	Freijó	Ipê
2.3	Brazilnut	Cacao	Cedro	Gmelina	
5.7	Brazilnut	Cacao	Cedro	Rubber Tree	
1.1	Brazilnut	Cacao	Freijó		
16	Brazilnut	Cacao	Freijó	Ipê	Jackfruit
cont.	Macacauba	Mahogany	Morototo	Piquiá	Rubber Tree
cont.	Sucupira	Ucuuba	Uxi		
9.6	Brazilnut	Cacao	Freijó	Rubber Tree	
2	Brazilnut	Cacao	Genipa Fruit	Mahogany	
2.2	Brazilnut	Cacao	Mahogany		
1.4	Brazilnut	Cacao	Rubber Tree		
0.5	Brazilnut	Cedro	Coffee	Freijó	Louro Vermelho
cont.	Macacauba				
-	Cacao	Candlenut	Cumaru	Mahogany	Rubber Tree
-	Cacao	Cedro	Freijó		
1	Cacao	Cedro	Freijó	Ipê	Mahogany
cont.	Rubber Tree				
1	Cacao	Cedro	Freijó	Mahogany	Pine
-	Cacao	Cedro	Freijó	Piquiá	
-	Cacao	Cedro	Freijó	Ucuuba	
10	Cacao	Cedro	Mahogany		
6	Cacao	Cedro	Rubber Tree		
1	Cacao	Coffee	Freijó		
0.1	Cacao	Coffee	Rubber Tree		
-	Cacao	Cumaru	Mahogany		
0.4	Cacao	Freijó	Guarana		

Table H-6--continued

Area	Crop	Crop	Crop	Crop	Crop
4.3	Cacao	Freijó	Rubber Tree		
1.5	Cacao	Gmelina	Guarana		
2.8	Cacao	Ipê	Mahogany	Rubber Tree	
0.5	Cacao	Macacauba	Rubber Tree		
5	Cacao	Mahogany	Passionfruit		
24.8	Cacao	Mahogany	Rubber Tree		
2	Cacao	Paricá	Terminalia		
5	Cacao	Pasture Grasses	Rubber Tree		
6.6	Cacao	Rubber Tree	Tatajuba		
19	Cacao	Rubber Tree	Vanilla		

4) Timber/Rubber Tree Type: 29.7 ha

Table H-7. Timber/Rubber Tree Simple Association

Area	Crop	Crop	Area	Crop	Crop
3	Andiroba	Freijó	2.5	Black Pepper	Teak
13.2	Black Pepper	Brazilnut	-	Freijó	Jacaranda da Bahia
0.8	Black Pepper	Ipê	-	Ipê	Rubber Tree
-	Black Pepper	Mahogany	0.4	Ipê	Teak

Table H-8. Timber/Rubber Tree Multiple Association

Area	Crop	Crop	Crop	Crop	Crop
1	Andiroba	Black Pepper	Mahogany		
1	Andiroba	Freijó	Ipê	Mahogany	
-	Black Pepper	Brazilnut	Mahogany		
1	Black Pepper	Ipê	Jacaranda do Pará	Mahogany	
1	Brazilnut	Cedro	Freijó	Mahogany	
-	Brazilnut	Freijó	Passionfruit		
1.4	Cedro	Freijó	Ipê	Mahogany	Rubber Tree
cont.	Teak				
1.5	Cedro Branco	Ipê	Jacaranda do Pará	Mahogany	
1.8	Ipê Roxo Serrado	Mahogany	Rubber Tree		
0.4	Cedro	Freijó	Jacaranda da Bahia	Morototo	Pau Rosa
cont.	Piquiá	Seringa	Ucuuba		
0.7	Guarana de Caroço	Ipê	Jacaranda do Pará	Jutaí Mirim	Leucaena
cont.	Mahogany	Tento Amarelo	Others		

5) Pasture Type: 5.8 ha

Table H-9. Pasture Simple Association

Area	Crop	Crop	Area	Crop	Crop
0.8	Black Pepper	Pasture Grasses	-	Pasture Grasses	Ipê
-	Pasture Grasses	Andiroba	-	Pasture Grasses	Jacaranda do Pará
-	Pasture Grasses	Baru	-	Pasture Grasses	Jutaí Açu
-	Pasture Grasses	Cuiarana	-	Pasture Grasses	Jutaí Mirim
-	Pasture Grasses	Cumaru	-	Pasture Grasses	Leucaena
-	Pasture Grasses	Fava Maputigui	-	Pasture Grasses	Mahogany
5	Pasture Grasses	Freijó	-	Pasture Grasses	Morototo

Table H-9--continued

Area	Crop	Crop	Area	Crop	Crop
- -	Pasture Grasses Pasture Grasses	Tatajuba Teak	-	Pasture Grasses	Tento Amarelo

Note: Multiple associations belonging to 'Fruit Orchard 10.9 ha' contained in Table F-2 of Appendix F) are included, whenever owners provided crop names.

APPENDIX I
TIMBER TREE GROWTH ON JAPANESE-BRAZILIAN FARMS AT TOMÉ-AÇU (THROUGH 1996)

Diameter at breast height (DBH) and height (H) of 2,201 multi-purpose trees (MPTs) were randomly measured throughout the Tomé-Açu settlement. This author used a DBH tape, a tape measure, and a clinometer to do this. When an individual height measurement was difficult to make, an average canopy height was recorded for several trees in the immediate vicinity. The year of planting of each measured tree was obtained from owners, through association with memorable family or settlement events. Some farmers had kept diaries listing the exact date(s) of planting. Tree age has been calculated as 1996 - Planted Year + 1 (nursery period). Biometric Data for 11 species were extracted to study the relationship between: 1) age and DBH; 2) age and height; 3) DBH and height; 4) DBH and hypothetical stem wood volume or $\pi(DBH/2)^2H/3$; 5) height and stem wood volume; and 6) age and stem wood volume. These results are in Figures I-1 through I-11.

The most noteworthy species was brazilnut (*Bertholletia excelsa;* see also Figure I-14), which produced high r-square

values over a 65-year growth period. Freijó (*Cordia goeldiana*) was a popular species among Japanese-Brazilians, because its wood resembles the highly appreciated kiri (*Paulownia tomentosa*) in Japan. However, this species revealed variable growth, and appeared unhealthy in fields where other tall tree species were absent. Andiroba (*Carapa guianensis*) was another popular species, due to its versatility in medicinal and timber uses. While this species was also found to have variable growth, its irregular, buttressed trunk form could have contributed to this inconsistent result. Cedro Vermelho (*Cedrela odorata*) is a high-class timber tree, comparable to mahogany (*Swietenia macrophylla*). However, its growth was also variable, and the stark contrast between healthy tall trees and suppressed individuals was impressive.

From the graphs of these 11 species, age and stem wood volume regression curves have been assembled in Figure I-12. Each of these curves has been multiplied by the standard wood price of Pará State (R$/$m^3$ log) used for tax purposes in the Tomé-Açu Microregion (Governo do Estado do Pará 1998), and is displayed in Figure I-13. This official wood evaluation seemed generally relevant to the wood market at Tomé-Açu during 1995-96, based on this author's first-hand knowledge and personal communications with local wood

businessmen. Figure I-13 is the basis for estimating farmers' potential annual income in 1995-96 from growing trees in their agroforestry fields. Paricá (*Schizolobium amazonicum*) and mahogany were becoming popular at that time, along with teak (*Tectona grandis*).

Based on their agroforestry experience during the past two decades (see Chapter 4), farmers decided to intercrop fast-growing 'white-wood' trees and shade tolerant 'red-wood' trees with another mid-term crop. The economic viability of this strategy is indicated in Figure I-13. For example, Paricá might be beneficial for mahogany and cacao (*Theobroma cacao*), by providing moderate shade and a supply of nitrogen. When Paricá is harvested after some 10 years, mahogany would be tall (Figure I-3), having grown straight from being shaded (see Chapter 4). Cacao supplies abundant leaf litter to the forest floor, which farmers appreciate from personal experience for the stability it provides to an agro-ecosystem. While current cacao bean demand is low, this could reverse itself at anytime in the future. The timber market appears sound in the long run, due to ever-diminishing natural forest resources worldwide. Thus, such a combination of crops could optimize farm income, as well as promote a sustainable form of agroforestry.

Appendix I--continued

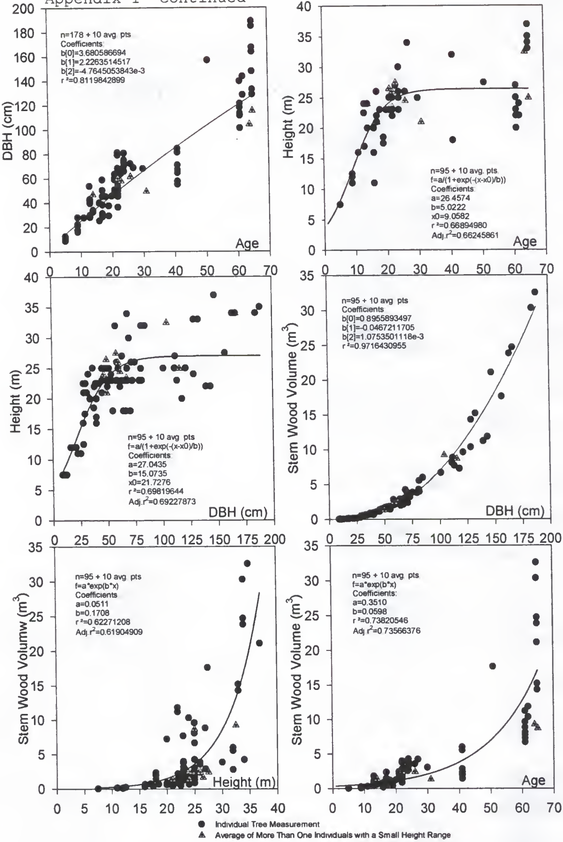


Figure I-1. Growth of brazilnut (*Bertholletia excelsa*)

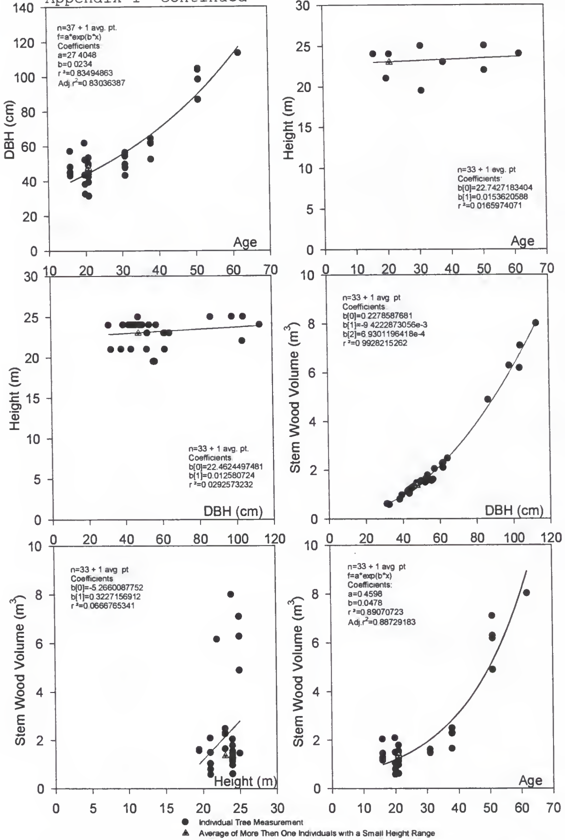


Figure I-2. Growth of rubber tree (*Hevea brasiliensis*)

Appendix I--continued

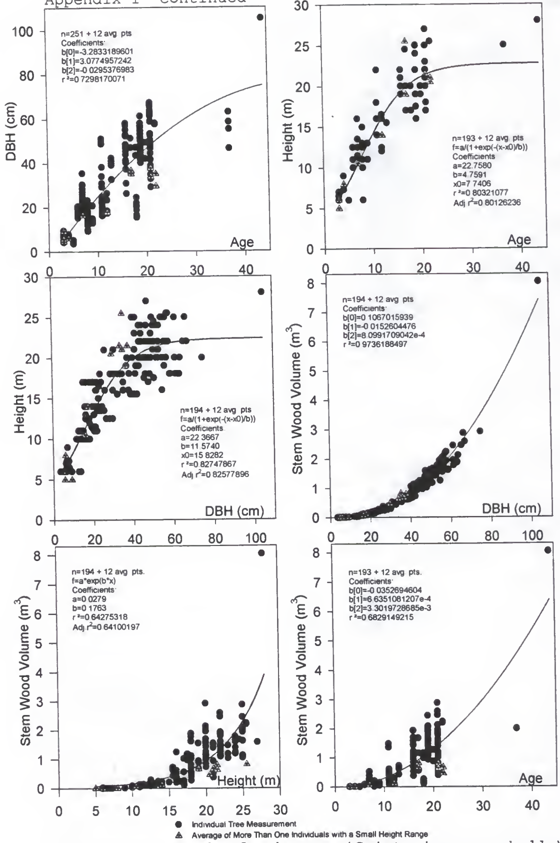


Figure I-3. Growth of mahogany (*Swietenia macrophylla*)

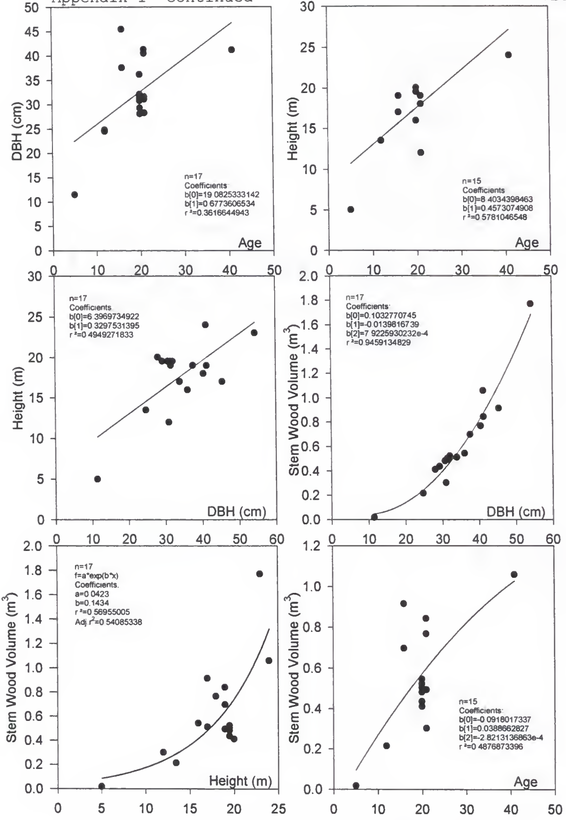


Figure I-4. Growth of piquiá (*Caryocar villosum*)

Appendix I--continued

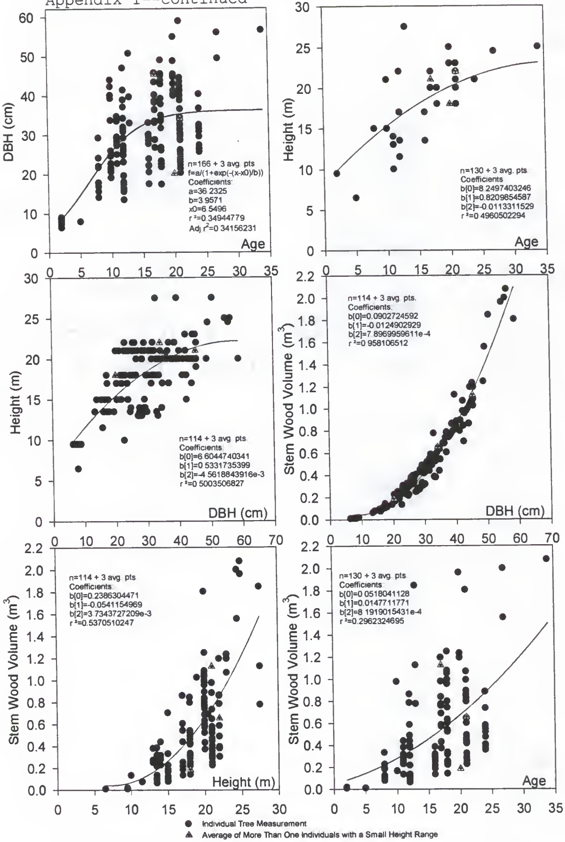


Figure I-5. Growth of andiroba (*Carapa guianensis*)

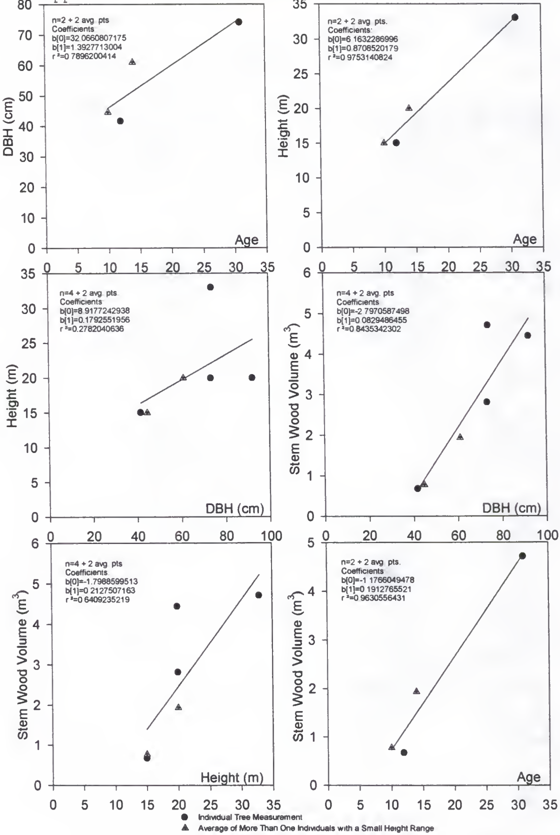


Figure I-6. Growth of gmelina (*Gmelina arborea*)

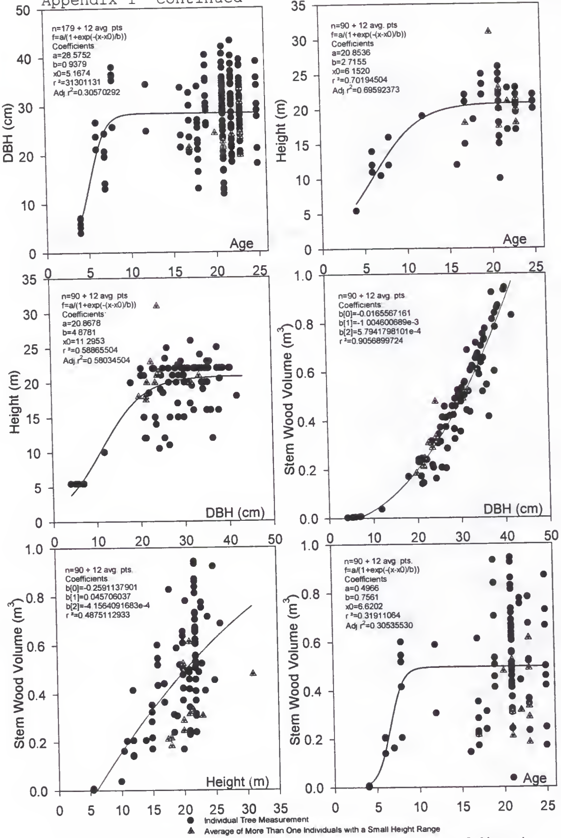


Figure I-7. Growth of freijó (*Cordia goeldiana*)

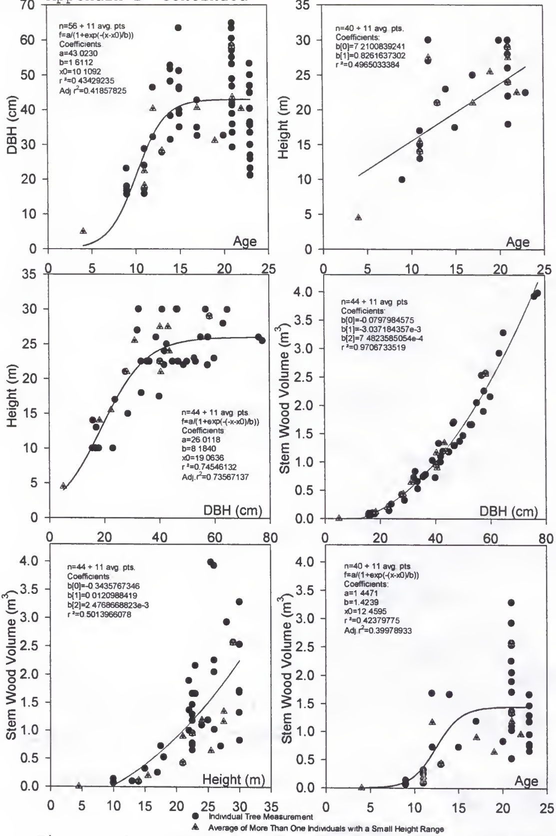


Figure I-8. Growth of cedro vermelho (*Cedrela odorata*)

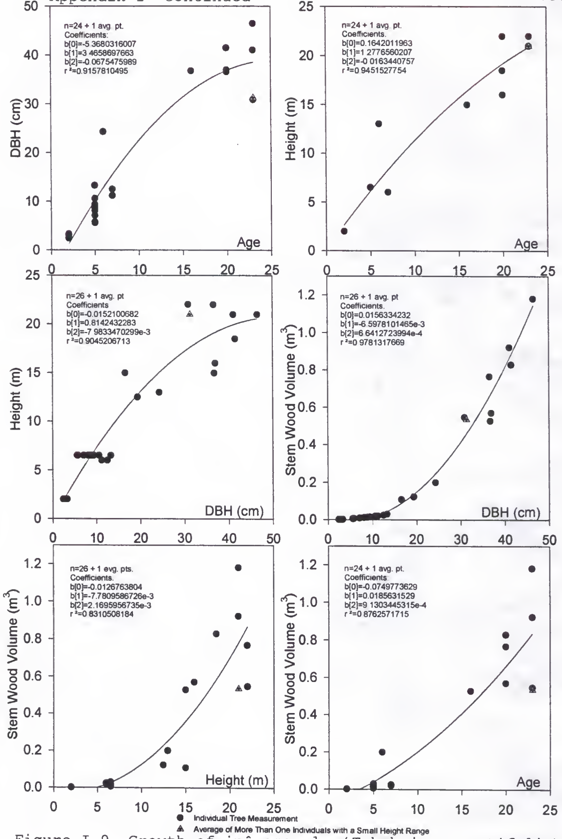


Figure I-9. Growth of ipê amarelo (*Tabebuia serratifolia*)

Appendix I--continued

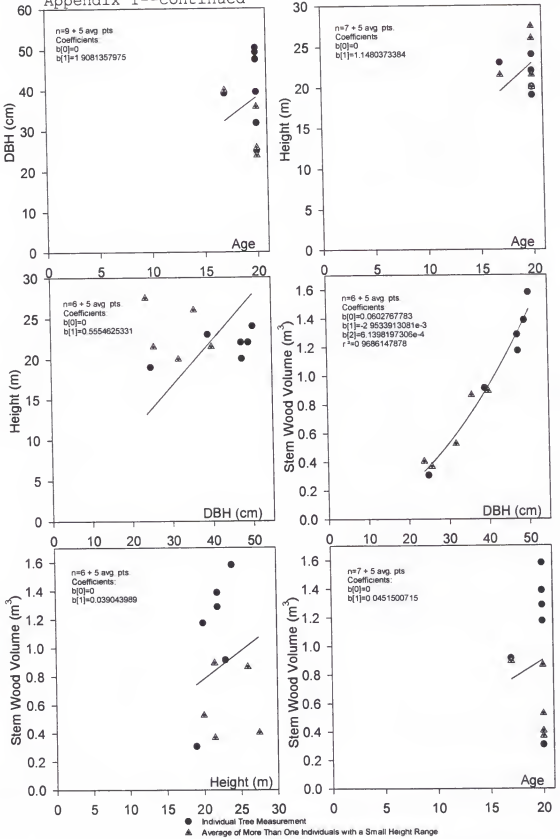


Figure I-10. Growth of macacauba (*Platymiscium ulei*)

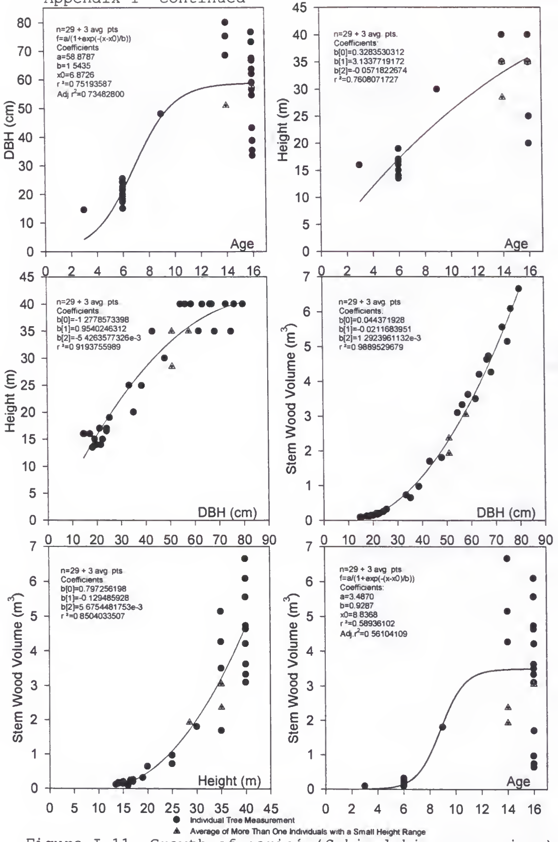


Figure I-11. Growth of paricá (*Schizolobium amazonicum*)

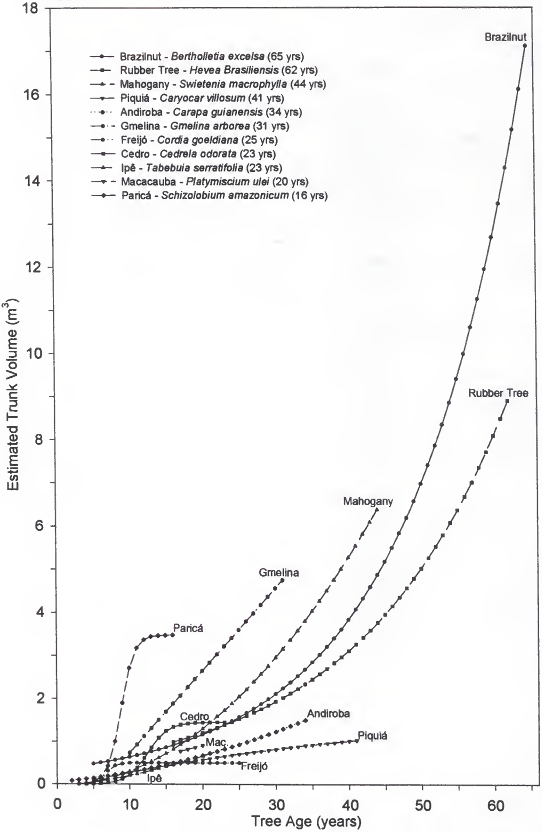
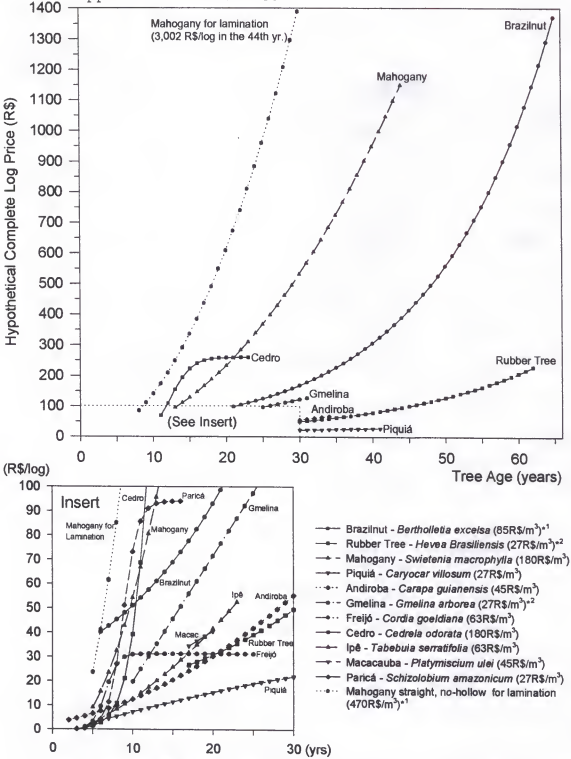


Figure I-12. Average wood growth at Tomé-Açu



Note: timber prices are from Governo do Estado do Pará (1998), except *[1]local sawmills and *[2]treated as soft wood (madeira branca) of Governo do Estado do Pará (1998).

Figure I-13. Average timber value at Tomé-Açu

Figure I-14. A 50-year-old brazilnut tree on Oshikiri Farm (Tomé-Açu Kaitaku Gojusshünenshi Henshü Iinkai 1985)

Reference:

Governo do Estado do Pará. 1998. Boletim Informativo Unificado de Preços Mínimos de Mercado do Produto Madeira II para 3ªRF, 4ªRF, 5ªRF, 6ªRF, 10ªRF e 13ªRF (Unified Bulletin for Minimum Market Prices of Wood Products in 3rd, 4th, 5th, 6th, 10th and 13th Federal Revenue Districts). p.9-10 in Anexo (Annex) of Diário Oficial do Pará (Pará State Official Journal). 1998/07/10. Governo do Estado do Pará, Belém, Brazil. (for Figure I-13)

Tomé-Açu Kaitaku Gojusshūnenshi Henshū Iinkai (The Editorial Committee for the 50-year History of Tomé-Açu Development). 1985. Midori-no-Daichi (The Green Earth). i. 135p. Tomé-Açu Bunka Kyōkai. Tomé-Açu, Brazil. (for Figure I-14)

APPENDIX J
LEAF AREA INDEX (LAI) OF CACAO AND CUPUAÇU FIELDS ON JAPANESE-BRAZILIAN FARMS AT TOMÉ-AÇU (1995-96)

A LI-COR LAI-2000 was used to take LAI measurements during mornings on sunny days without clouds (Table J-1). Each crop is listed in order of its per hectare production (actual sales) during the survey period (see Figure 5-20). LAI increased during the rainy season. Andiroba provided the densest shade and suppressed the growth of cacao. This suppression was commonly observed throughout the settlement. Eritrina (of three *Erythrina* species) and palheiteira seasonally produced a lot of leaves. However, palheiteira was often defoliated by caterpillars and, as a consequence, had high mortality. Eritrina shed all its leaves when flowering in the dry season. According to farmers, two eritrina species grow large quickly, and often fall or break boughs during storms in the rainy season. Rubber trees were generally affected by leaf-shedding diseases, which could be beneficial to understory cacao in terms of shade control. The old rubber variety of Kondō was exceptional, as it always looked healthy and maintained dense leaves. The low LAI observed here was probably due to the period of

measurement, which coincided with leaf changing during that year. The lower LAI of rubber-cacao intercropping on the Takahashi farm was due to a rubber variety which was less resistant to leaf-shedding diseases. It should also be noted that Takahashi and Ōnuki provided more fertilizer to cacao than other farmers, and stopped fertilizing the most recently. In a portion of the healthy field of Ōnuki, where original shade trees were gone except for a few voluntary imbauba (*Cecropia* spp.), high LAIs were obtained comparable to that of the portion having canopy trees. The owner reported that cacao production was apparently higher where there were no shade trees. However, this wasn't true in all cases, and Inada reported to the contrary. In his field, cacao trees didn't look good where shade trees had been removed, and some were even perishing. The low LAIs of cupuaçu on the Tanaka and Sasaki farms were due to the presence of anomalies, where new seedlings were planted in the pits of dead trees. Maki and Konagano observed prolonged cupuaçu production under shade trees in drought years, compared to that without shade trees. However, Konagano eventually chose an intensive, non-shading management approach, with frequent trimming, parasite cleaning, fertilizer application, and irrigation when necessary.

Table J-1. LAIs measured on Tomé-Açu agroforestry fields

Crop/Farm[*1]		Canopy Trees	Dry Season End[*2] w/ canopy trees LAI (SEL[*4]) Date	Rainy Season End[*3] w/ canopy trees LAI (SEL[*4]) Date	w/o canopy trees LAI (SEL[*4]) Date
Cacao	KD	Rubber Tree		3.73 (0.26) 06/08 4.23 (0.17) 06/08	
	SG	Andiroba	4.33 (0.22) 12/19 5.59 (0.12) 12/19	6.23 (0.20) 06/13 7.12 (0.35) 06/13	
	SZ	Eritrina		4.98 (0.24) 06/13 5.50 (0.24) 06/13	3.09 (0.29) 06/13 3.33 (0.42) 06/11
	SH	Mahogany, etc.	3.26 (0.36) 11/20 3.97 (0.20) 11/20	4.66 (0.21) 05/26	
	EK	Eritrina, Palheiteira		4.41 (0.13) 06/15 5.60 (0.38) 06/15	
	IN	Eritrina, Palheiteira		5.75 (0.19) 05/25 6.41 (0.25) 05/25	3.18 (0.33) 05/25
	ON	Freijó, Macacauba		4.48 (0.24) 05/26 4.70 (0.19) 05/26	4.46 (0.16) 05/26 5.20 (0.17) 05/26
	TH	Rubber Tree		2.11 (0.28) 06/17 4.60 (0.18) 06/17	
Cupu-açu	TN				1.52 (0.14) 06/15 2.88 (0.42) 06/15
	IJ				3.07 (0.30) 06/19 3.41 (0.46) 06/19
	SK				1.44 (0.21) 06/15
	MK	Freijó, Macacauba	3.10 (0.20) 11/27 3.26 (0.23) 11/27	4.64 (0.37) 05/26 4.69 (0.33) 05/26	
	KG				3.47 (0.56) 06/19 3.77 (0.46) 06/19

Note: Random 10 samples were taken for each LAI measurement. The lowest (above) and highest (below) LAI readings are listed when available.

*[1] See Table 5-1 for farm codes.

*[2] year 1995

*[3] year 1996

*[4] standerd error of the LAI determinations

These results seemed generally consistent with the study of Ewel et al (1982) in Costa Rica and Mexico (see Table J-2). The authors expected higher LAI of the wooded homegarden if measurements had been taken in the rainy season, when a deciduous overstory species is in full leaf. The high LAIs observed on the cacao agroforestry fields of Sakaguchi (w/andiroba) and Inada (w/unlopped eritrina and palheiteira) might be explained by the same reason.

Table J-2. LAIs of nine ecosystems in Costa Rica and Mexico

Ecosystem	**Age**	**# Species present**	**LAI (S.D.)**
Young maize	2 months	7	1.0 (1.2)
Mature maize	3.5 months	20	2.6 (1.6)
Sweet potato	48 days	8	2.9 (1.3)
Cacao-plantain-*Cordia alliodora* agroforestry	2.5 years	4	3.4 (3.0)
Wooded homegarden	40+ years	18	3.9 (2.7)
Coffee-*Erythrina poeppigiana* agroforestry	25 years	7	4.0 (2.9)
Agroforestry mimicing secondary succession	11 months	27	4.2 (2.2)
Gmelina arborea plantation	2.7 years	8	5.1 (2.5)
Secondary succession	11 months	35	5.1 (3.5)

Source: Ewel et al (1982)

Reference:

Ewel, J., Gliessman, S., Amador, M., Benedict, F., Berish, C., Bermúdez, R., Brown, B., Martínez, A., Miranda, R. and Price, N. 1982. Leaf Area, Light Trasnmission, Roots and Leaf Damage in the Nine Tropical Plant Communities. Agro-Ecosystems Vol. 7. p.305-326.

APPENDIX K
ABOVE-GROUND BIOMASS ESTIMATE OF CROP AND PASTURE SYSTEMS AT TOMÉ-AÇU, PARÁ, BRAZIL

Acerola (*Malpighia glabra*)

An effort to develop an allometric equation for aboveground biomass of acerola was conducted in Lot No. 299, Breu 1-2, following the methodology of Subler (1993). The lot owner Yōichi Inada (1950-) was a ***CAMTA*** board member in charge of ***ATEA***, who had selected the high yielding 'Inada Variety' of acerola. A 1.5 ha sample field was planted in 1991 with 577 grafted seedlings. According to the owner, most of these rooted, but some dead trees had to be replaced by new seedlings in subsequent years. By August of 1996, 573 trees were alive in the field, of which 126 trees were randomly selected within four 25 m X 25 m quadrats (Table K-1).

Table K-1. Descriptive statistics of 126 acerola trees

Measures	Range	Median	Mean (95% C.I.)
Stem Diameter (Ds)^{*1}	5.2 - 23.2	12.9	13 (12.5 - 13.5)
Sum of 1° Branch Diameters (Db)^{*1}	4.2 - 43.4	23.4	23.8 (22.5 - 25)
(Ds) + (Db)^{*1}	11.6 - 63.5	36	36.8 (35.1 - 38.4)
Number of Primary Branches	1 - 6	3	3.2 (3 - 3.3)
Canopy Height (H)^{*2}	1.3 - 3	2.3	2.3 (2.2 - 2.3)
$(Ds)^2(H)$	51.4 - 1560.9	371.5	415.4 (373 - 457.8)

^{*1} Unit in centimeter (cm). ^{*2} unit in meter (m).

Acerola stems had irregular and undulating surfaces. All of these stems were short, ranging from 0 cm to 30 cm. This shortness was probably due to grafting. Stem diameters were therefore measured at the midpoint so that swelling near the base and jorquettes of primary branches could be excluded as much as possible.

From the sample in Table K-1, 8 individual trees were randomly chosen for destructive sampling. Tree components were separated to leaves, fine branches under 2 cm in diameter, gross branches over 2 cm in diamter, and stems. All fruits and flowers were removed. Three sub-samples of leaves, two of fine branches, and one of gross branches were taken by grab-sampling. A disk sub-sample was taken from a stem.

Accommodating the schedules of assistants from the Federal Agricultural College of Pará (***Faculdade de Ciências Agrárias do Pará - FCAP***) in Belém, one tree was sampled on August 8, 1996, while seven other trees were sampled from August 29 to September 1, 1996. After measuring the fresh weight of samples and sub-samples at the Y. Inada Farm, the sub-samples were carried to ***FCAP*** and oven-dried. Unfortunately, an accident occurred with the oven malfunctioned due to frequent power surges, burning the sub-samples from 5 trees. Hence, additional sampling of 5 more

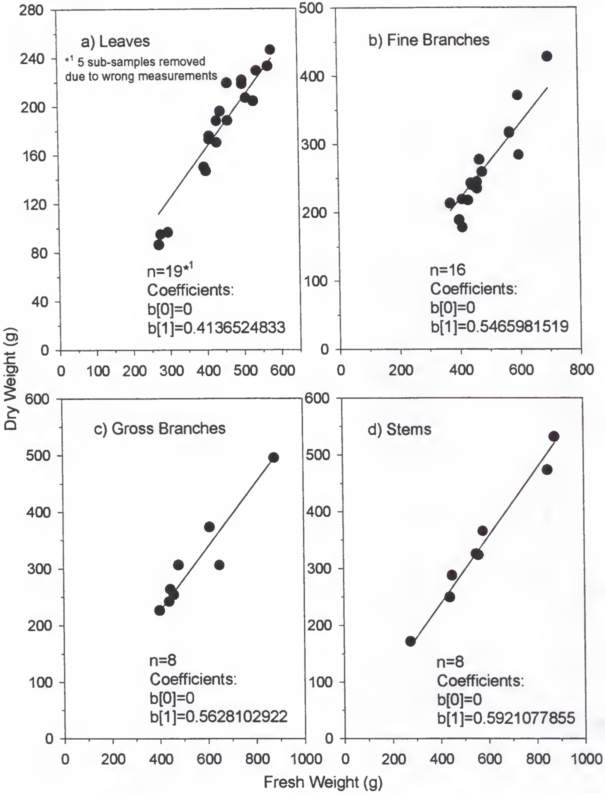


Figure K-1. Fresh weight vs dry weight of acerola sub-samples

trees was conducted from September 16 to September 20, 1996. The weights of dried sub-samples are listed in Figure K-1.

Applying the regression equations (forced to pass through the origin) in Figure K-1 to fresh weights of the 13 sampled trees yielded a dry weight estimate calculation for each of the trees (Table K-2). The average fruit production of the Inada Variety trees in this field was expected to attain 90 kg/tree/year in 1996. In this author's study, 2,940 g of fresh fruits (a total of 3 grab-samples) weighed 213 g after being oven-dried. By applying this ratio, as estimate of fruit dry matter production from an average tree would be 6.52 kg/year. Assuming a ripened fruit falls from a branch four weeks after flowering, an average tree might bear 540 g of fruit dry matter at any time. While appearing large, this still represents less than 2% of the average total biomass of the 13 sampled trees.

Table K-2. Dry weight estimates of sample acerola trees

Sample ID	Diameter (cm)	Basal Area (cm^2)	Height (m)	Dry Biomass (kg) leaf	f. branch	g. branch	stem	total
Q1-02	10.6	88.2	2.2	4	12.5	5.4	2.3	24.1
Q1-18	10.3	83.3	1.8	6.5	15.6	1	2.2	25.2
Q2-21	9.3	67.9	1.7	3.9	4.4	12.8	1.7	22.7
Q2-28	12.8	128.6	2.4	5.1	13.7	6.9	1.2	26.8
Q3-02	14.2	158.3	2.4	7.6	6.1	18.5	3.3	35.4
Q3-05	13.8	149.5	2.5	3.1	7.6	4.8	2.2	17.7
Q4-07	13.3	138.9	1.5	4.9	12.5	10	2.1	29.4
Q4-24	16.2	206	2.3	4.1	11.9	9.4	1	26.3
Q1-23	11.3	100.2	2.3	4.5	3.4	14.5	1.5	23.9
Q1-30	11.6	105.6	1.8	6.9	5.8	27.7	2.8	43.2
Q2-29	12.7	126.6	2.3	3.5	3.7	14.7	1.6	23.5
Q4-09	17.3	234.9	2.3	6	12.6	14.2	2	34.7
Q4-25	13.4	141	2.2	2.6	10.6	6.4	1.3	20.9
total	166.8	1729.0	27.7	62.7	120.4	146.3	25.2	353.8
mean	12.8	133.0	2.1	4.8	9.2	11.2	1.9	27.2
std.dev.	2.3	47.7	0.3	1.5	4.2	7.0	0.7	6.9

Unfortunately, no significant independent variable was found to construct an allometric equation for acerola biomass on a dry weight basis. A suspected confounding influence was leaf change during the extended sampling period. Leaves contributed 17.7% to total biomass. However, separation of the leaf component from other components made little difference. Another noticeable feature of these trees was the large contribution of the branch component, 75.2%, to total biomass.

Therefore, a traditional approach had to be used to estimate biomass production from acerola fields:

$$W/G = \Sigma w/g$$

where W is the plot weight, G is the plot basal area, Σw is the sum of the weights of sampled trees, and g is the sum of the basal area of sampled trees (Satoo 1982). This yielded:

$$W \fallingdotseq 0.2046G$$

However, this required the following modification:

$$Wt/nt \fallingdotseq 0.2046Gm/nm$$

where Wt is the total plot weight, nt is the total number of acerola trees in the plot, Gm is the basal area of trees with a measurable stem, and nm is the number of trees with a measurable stem. There were acerola trees that immediately branched at the base in the fields of Sasaki, Takamatsu, and Oppata, where economic surveys were conducted. Acerola field biomass results are listed in Table K-3.

Table K-3. Acerola field biomass estimates

Farm	sample*[1]	mn*[2]	Gm (cm^2)*[3]	tn/ha*[4]	Wt(kg)/ha*[5]
Inada, Y.	126	126	17563.3	382	10894.4
Oppata	154	135	8279.4	425	5332.9
Sasaki	82	48	9487.3	258	10433.4
Takamatsu	136	88	23352.5	290	15745.4

*[1] number sampled in four 25 m X 25 m quadrates (0.25 ha)
*[2] number of sample trees with measurable stem diameters
*[3] sum of basal area of sample trees with measurable stem diameters
*[4] plant number per hectare in real agro-ecosystem, which includes strip roads and fire breaks.
*[5] estimated biomass per hectare in real agro-ecosystem

Açai (*Euterpe oleracea*)

Within the allowed time frame, this author couldn't conduct a field biomass study of semi-natural açai groves found along small streams (***igarapés***). Açai palms grew in medium-sized secondary vegetation (20-40 years old) on the Sakaguchi and Q. Itō Farms. Other than harvesting these palms, the owners had not practiced specific management, such as selective slashing in favor of açai. After initially planting small areas decades ago, the caretaking role was left to wild birds, which dispersed palm seeds, expanding açai groves. The biomass of such extractive agro-ecosystems might be similar to that of the 25-year secondary forest at Tomé-Açu, studied by Subler (1993).

Volunteer açai palms in sample plots of cacao/cupuaçu fields on the Eikawa, K. Inada, Sakaguchi and Maki Farms were measured to obtain their stem diameter and height. To

estimate biomass of these sampled palms, the dry matter allocation study for patauá palm (*Jessenia bataua*) of Balick and Anderson (1987) was applied. In their study, a single sample palm had a cylindrical stem of 25.1 m, with a mean diameter of 15.5 cm. The average weight of the oven-dried stem was 0.7 g/cm^3, and the estimated stem dry mass was 331 kg. They also oven-dried three leaves and found their weights to be 7.7-8.4 kg (an average of 8.0 kg) per leaf. The minimum value 7.7 kg was used to calculate lifetime leaf production (158 leaves) for that sampled palm. In the case of a mature açai palm in this study, 8-9 leaves were always visible on its stem. Applying this number to the sampled patauá palm of Balick's and Anderson's study (though this might not be the case for this latter species), the leaf dry weight accounted for approximately 20 percent of total stem weight. Therefore, to obtain a rough estimate of açai biomass, the following simple equation was used:

$$w = 1.2 \text{ X } 0.7sv/1000$$

where w is the individual dry weight (kg) of stem and leaves, and sv is the stem volume (cm^3). The leaf biomass estimate used here is inaccurate and needs further research. However, the biomass of volunteer açai palms was small relative to other species in the agro-ecosystems investigate (see Table K-5). Açai biomass on a per hectare basis on the

Eikawa and K. Inada Farms was obtained by multiplying sample values by four. Though small, this could be an overestimate as there are roads and fire breaks within these agro-ecosystems.

Cacao (*Theobroma cacao*) and
Cupuaçu (*Theobroma grandiflorum*)

In each cacao field on the Kondō, Ōnuki, Suzuki, Eikawa, K. Inada, Sasahara, and Takahashi Farms, four 25 m x 25 m quadrats were randomly chosen, and live cacao trees within them were measured to obtain their stem diameter (cm) at about 50 cm above ground and the diameters (cm) of all their primary branches. On the Sakaguchi Farm, all cacao trees in a 0.5 ha field were measured.

Similarly, cupuaçu trees on the Hiramizu, J. Itō, Konagano, Maki, Sasaki, and Tanaka Farms were measured in four 25 m X 25 m quadrats at each site.

The allometric equation of Subler (1993) was applied to this collected data:

$$\log Y = -1.81 + 2.13 \log Dt$$

where Y is the dry weight of a tree, and Dt = Ds (stem diameter) + Db (sum of primary branch diameters). See Table K-5 for results.

However, young cupuaçu trees intercropped in the black pepper field of Suzuki, and the passionfruit fields of

Miyagawa and Hashimoto could not be measured. Hence, the average weight (kg) of a cupuaçu tree on each of the Hiramizu, Konagano, and Sasaki Farms (which had uniform-aged fields) were regressed for age, by forcing the line to pass through the origin, to obtain estimated average weights for young trees aged 1 to 4 years old (Table K-4).

Table K-4. Young cupuaçu tree dry weight estimates

Farm	Planted Year	Age	Sample Trees / Weight (t)		Per Tree Weight (kg)
Hiramizu Konagano Sasaki	1991 1988 1988	5 8 8	66 107 136	0.45 1.89 2.39	6.8181818 17.663551 17.573529
Equation: $w = -0.034166x + 0.2795604x^2$ where w = tree dry weight, x = tree age					(Estimates)
Hashimoto Suzuki Miyagawa/ Hashimoto	1995 1994 1993 1992	1 2 3 4			0.2453948 1.0499104 2.4135468 4.3363039 (Refer to Table K-7)

<u>Rubber Tree (*Hevea brasiliensis*),</u>
<u>Brazilnut (*Bertholletia excelsa*), and all other trees</u>

From February to April of 1996, four 25 m X 25 m quadrat samples were taken at each applicable site, unless otherwise noted in the sample number column of Table K-5 (e.g. one quadrat data set from Kondō's rubber field is missing). Stem diameter at breast height (DBH) and height measurements for each tree were inserted into the allometric equations of Uhl et al (1988):

$$\ln Yl = -0.66 + 1.43\ln D^2 - 2.10\ln H$$

where Yl = leaf biomass, D = stem DBH, H = height; and

$\ln Yw = -2.17 + 1.02\ln D^2 + 0.39\ln H$

where Yw = wood biomass, D = stem DBH, and H = height.

As was done for acerola, tree biomass on a per hectare basis was calculated using the ratio of the number of sampled trees to the actual per hectare number of trees in 1996. Actual fields are not necessarily planted uniformly, having variable spacing, varying degrees of crop damage, and different road and fire break allocations within each sampled field. Therefore, owner's records were used to calculate the average quantity of crop plants present in a field on a per hectare basis. However, farmers were not interested in mere shade trees like eritrina and palheiteira, and many didn't know how many such trees were alive at the time of this study. Because of this, per hectare numbers are missing in Table K-5, and sample biomass measurement were simply multiplied by four to obtain biomass per hectare. This may yield an overestimate of biomass considering the space of roads and fire breaks in a field.

Biomass estimates of brazilnut trees growing in the passionfruit fields of Miyagawa and Takahashi (see Table K-7) were obtained by inserting mean diameter and mean height measurements of sampled trees into the allometric equations of Uhl et al. (1988). Mean individual tree biomass estimates were then multiplied by the number of trees per hectare of each field.

Subler (1993) used an equation for rubber tree biomass derived from Malayan studies in 1960s:

$$\ln Y = 1.035 + 0.233D$$

where Y is tree biomass, and D is stem DBH.

This yielded 277.0 t/90 sample trees (495.5 t/ha) for Kondō trees, and 46.9 t/86 sample trees (207.8 t/ha) for Takahashi trees, which seemed somewhat of an overestimate. Hence, this author used the previous equation of Uhl et al (1988) for rubber tree biomass estimates also.

Table K-5. Biomass estimates of *Theobroma* fields

Base Crop	Farm	Crop Association	Planted Year	Individuals Sampled	Individuals per ha	Biomass (t/ha)
Cacao	Eikawa	cacao	1975-84	203	543	12.97
		shade trees		56		52.47
		açai		1		0.48
	Inada, K.	cacao	1975-86	264	667	20.36
		shade trees		24		35.09
		açai		3		0.56
	Kondō	cacao	1965-73	251	413	9.81
		rubber tree	1965-73	90/0.1875ha	161	44.18
	Ōnuki*[1]	cacao	1974-85	138	770	25.43
		timber trees	1974-86	200	172	36.9
	Sakaguchi	cacao	1970	247/0.5ha	494	16.71
		timber trees	1970-82	387/0.5ha	774	217.74
		açai		254/0.5ha	508	11.66
	Sasahara	cacao	1980	195	649	13.83
		timber trees	1980-85	427/1.75ha	244	93.14
	Suzuki	cacao	1975	200	487	26.03
		shade trees		6		34
	Takahashi	cacao	ca.1986	89	260	7.85
		rubber tree	ca.1974	86	381	57.98
Cupuaçu	Itō, J.		1987-89	115	277	4.37
	Konagano		1988	107	357	6.3
	Maki	cupuaçu	1977	93	386	12.51
		timber trees	1974-81	393/2ha	197	54.19
		açai		76/2ha	38	2.06
	Sasaki		1988	136	624	10.95
	Tanaka		1986-87	101	240	4.51

*[1] Overstory tree spacing varied considerably in this cacao field. Samples were taken from central plots having densely planted timber species.

Table K-6. Intercropped tree species in cacao/cupuaçu fields, and their per hectare biomass

Species	Planted Year*[1]	Num -ber	Bioms. (t/ha)	Species	Planted Year*[1]	Num -ber	Bioms. (t/ha)
<ŌNUKI Farm - Cacao 20.9 ha>				<SAKAGUCHI Farm> - continued			
Andiroba	1976	158	2.33	Pau de pico	volunteer	2	0.09
Brazilnut	1973	2	0.23	Puruí	volunteer	5	0.36
Brazilnut	1983-84	29	1.33	Sweet Oranges	n/a	50	5.57
Cedro	1976	15	0.78	Tamanqueira	volunteer	3	0.52
Cedro	1986	20	0.14	Tinteiro	volunteer	11	0.43
Freijó	1974-75	2974	21.09	Total		387	217.7
Gmelina	1983	26	1.98	<SASAHARA Farm - Cacao 1.75 ha>			
Macacauba	1977	309	5.52	Andiroba	1980	15	8.4
Mahogany	1976	13	0.47	Brazilnut	1980-85	27	14.98
Rubber Tree	1972	30	1.85	Embaúba	volunteer	3	0.14
Rubber Tree	1975	20	1.18	Freijó	1980	217	18.23
shade trees	n/a	n/a	n/a	leguminous sp.	volunteer	1	0.01
Total		3596	36.9	Macacaúba	1980	52	21.35
<SAKAGUCHI FARM - Cacao 0.5 ha>				Mahogany	1980-85	104	28.84
Ameixa	volunteer	1	0.2	Tatajuba	volunteer	8	1.19
Andiroba	1973	182	139.8	Total		427	93.14
Cumarú	1964	19	10.35	<MAKI Farm - Cupuaçu 2.0 ha>			
Envira	volunteer	3	0.11	Bacuri	volunteer	2	0.07
Eritrina	1970	21	44.01	Eritrina	1977	1	0.91
Guava	volunteer	1	0.25	Freijó	1974	229	27.38
Imbaúba	volunteer	8	2.58	Lime	n/a	2	0.02
Jamelão	volunteer	3	0.67	Macacaúba	1977	123	24.44
Mammee Apple	n/a	1	0.04	Macadamia	n/a	10	0.22
Mundu (Rata)	n/a	57	9.61	Palheiteira	n/a	1	0.14
Mango	n/a	1	2.1	Sapodilla	n/a	20	0.11
Murta	volunteer	5	0.11	Tatajuba	volunteer	3	0.9
Parapará	volunteer	2	0.03	Uxi	n/a	2	0.01
Paricarana	volunteer	12	0.9	Total		393	54.2

Note: All trees listed for Sakaguchi, Sasahara, and Maki were measured for height and DBH to derive biomass. For Ōnuki trees, the mean estimates of measured sample trees were multiplied by the number of tree in the entire sample field.

*[1] Volunteer species consisted of: 1) those always saved by rural Brazilian laborers, e.g. tatajuba (for hoe handles), guava and bacuri (for fruit) and cashew (for fruit and nuts); 2) species saved by the owner, e.g. parapará and paricarana (for wood); and 3) those growing back vigorously after slashing and for which owners have given up eradication efforts, e.g. imbauba.

Timber trees on the Ōnuki, Sasahara, Sakaguchi, and Maki farms in Table K-5 also include non-timber species. Refer to Table K-6 for details. There are missing data for shade trees (eritrina and palheiteira) partially intact in

Ōnuki's cacao field. Hence, actual overstory biomass there should be greater than the calculated estimate.

Black Pepper (*Piper nigrum*) and Passionfruit (*Passiflora edulis*)

The mean dry weights of 4.625 kg of passionfruit (from a 3rd-year plantation), and 6.172 kg of black pepper (from a 10th year plantation, supplemeted for 6-7 years after its initial planting) were measured on the J. Itō Farm from 1988-90 (Subler 1993). This information was used to estimate the biomass on a per hectare basis. In Table K-7, the vine numbers came from individual farm records dating from September 1995. These numbers, especially those of black pepper, must have declined at different rates over a year. Other trees listed were present as of January 1996.

Table K-7. Biomass estimates of perennial vine crop fields

Base Crop	Farm	Crop Association	Planted Year	# Sampled	# Per ha	Biomass (t/ha)
Black Pepper	Hiramizu	black pepper	1991-92		1111	6.86
		cupuaçu	1991	66	233	1.53
	Konagano		1992		1429	8.82
	Ōnuki		1990		625	3.86
	Suzuki	black pepper	1991		1100	6.79
		cupuaçu	1994		175	0.18
Passionfruit	Hashimoto	passionfruit	1994		511	2.36
		cupuaçu	1992		187	0.81
		cupuaçu	1995		28	0.01
	Itō, J.		1994		911	4.21
	Miyagawa	passionfruit	1994		500	2.31
		cupuaçu	1992		255	1.11
		brazilnut	1991	10	20	0.79
	Takahashi	passionfruit	1994		480	2.22
		cupuaçu	1996		seeded	-
		brazilnut	1978	13	3	1.51

Pasture (*Brachiaria brizantha, B. humidicola,* and *Pueraria phaseoloides*)

Grass sampling was conducted on three ranches from May 27-June 2, 1996. Sampling locations were chosen on ranch maps, containing information about spcies planted, year, and treatments undertaken. Owners' opinions about 'the most representative' portion of their ranches were considered. At each site, the origin and the direction of a 500 m transect was determined by throwing a branch. Along the right side of the transept, a one square meter quadrat was placed every 50 m, and all pasture grasses within these quadrats were harvested. Weeds that were periodically removed by ranchers were excluded. Both a fresh sample and a sub-sample (by grab-sampling) were weighed for each quadrat, and 10 sub-samples from each transept were brought to ***FCAP*** for oven drying (Figure K-2).

For each site, the mean sample dry weight and the confidence interval (C.I.) of the population mean were calculated by applying the correponding coefficient in Figure K-2. The results are listed in Table K-8. The large C.I. ranges, such as for *Brachiaria brizantha* on the Largo Grande Ranch, and for *B. humidicola + B. brizantha* on the Piramide Ranch, reflect the presence of wood debris and/or weed bush in sampled quadrats.

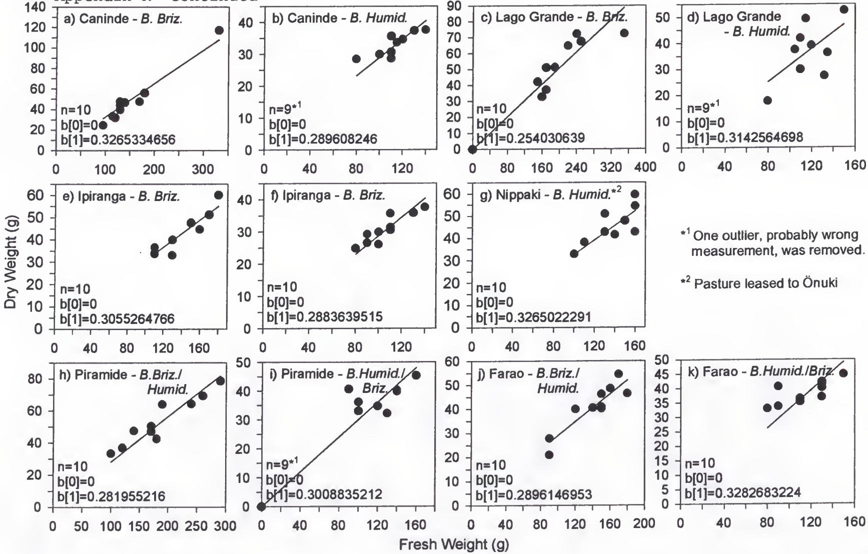


Figure K-2. Fresh weight vs dry weight of pasture grass sub-samples

Table K-8. Dry Weights of Sample Pasture Grasses

Farm	Harayashiki*3				Ōnuki*4		Takahashi*5			
Ranch	Caninde		Lago Grande		Ipiranga		Piramide		Farao	
Sp.*1	B	Q	B	Q	B	B	B+Q	Q+B	B+Q	Q+B
Mean	413.7	289.9	298.2	229.1	170.3	117.1	384.6	250.4	290.8	232.7
95% C.I.	328.3 499.2	148.4 431.4	83.5 513.0	134.3 323.8	111.4 229.2	62.4 171.8	223.8 545.3	96.4 404.4	149.3 432.2	176.9 288.6
Area	267.5	114.0	260.0	235.0	335.0	65.0	437.2	29.8	550.0	180.0
Planted in	1994-95	1986-90	1991-93	1980-92	1990-95	1987-89	1991-95	1976-80	1988-95	1973-87
BR*2	3138.5 kg/ha				1616.8 kg/ha		3153.1 kg/ha			

Note: Biomass dry weights are in grams per square meter (g/m^2), and pasture area in hectare (ha).
*1 B = *Brachiaria brizantha*, Q = *Brachiaria humidicola*. Takahashi mix-planted these two species and *Pueraria phaseoloides*, which was sampled very little this time.
*2 dry biomass estimate of entire ranch weighed by area.
*3 excludes 96.2 ha *B. brizantha* at Caninde planted in 1996.
*4 *B. humidicola* of Ipiranga (65.0 ha) couldn't be sampled due to pasture rotation. According to Ōnuki, *B. humidicola* was less productive than the recently introduced *B. brizantha*. While both sample means were small on his ranch, the smaller value was substituted for the *B. humidicola* biomass estimate.
*5 Piramide B+Q includes 25 ha leased to a friend.

During this period, Harayashiki and Ōnuki lacked grass, and moved a portion of their herds to Nippaki Ranch (***Fazenda Nippaki***), where idle pastures were available for lease. One *B. humidicola* lot of 1980, being leased to Ōnuki, was sampled for its biomass. The mean value there was 605.7 g/m^2, with a C.I. ranging from 364.5 g/m^2 to 846.8 g/m^2.

Table K-9 is the basis for estimating animal biomass in pasture systems. Cattle fed on leased pastures elsewhere had to be deducted first. Harayashiki moved 530 head of Caninde to the Nippaki Ranch from October of 1995 to January

Table K-9. Live weights of all domestic animals

Category & Mean Weight (kg)		Initial #	System Export*[1] Dead	/ Sold Alive	System Import*[1] Born	/ Purchased	Final #
Harayashiki Farm (pasture 876.5 ha)							
Bulls	450	14		2		1	13
Oxen+Garrotes	300	217	2	160			55
New Garrotes	250						42
Male Calves	120	78	4	113	165		84
Cows+Heifers	300	667	4	23			640
New Heifers	250						143
Female Calves	120	93	1		173		122
Horses	200	11					11
Total Weight (kg)		294220	2400	94316			287430
Adjustment (kg)*[2]		-53000					-53000
(kg/ha)		275.2	2.7	107.6			267.5
Mean Stock (kg/ha)*[3]							271.4
Dead+Sold (kg/ha/day)			0.3				
Ōnuki Farm (pasture 400 ha)							
Bulls	450	7					7
Oxen+Garrotes	300	64		57			7
Cows+Heifers	300	229	2	3			224
New Garr./Heif.	250						100
Calves	120	75	3		155		127
Horses	200	8					8
Total Weight (kg)		101650	960	26960			114290
Adjustment (kg)*[2]		-19800					-27040
(kg/ha)		204.6	2.4	67.4			218.1
Mean Stock (kg/ha)*[3]							211.4
Dead+Sold (kg/ha/day)			0.2				
Takahashi Farm (pasture 1172 ha)*[4]							
Bulls	450	24	1	4		5	24
Oxen+Garrotes	300	236	6	97			133
New Garrotes	250						221
Male Calves	120	169	5		174		117
Cows+Heifers	300	430	6	21			403
New Heifers	250						298
Female Calves	120	242	4		184		124
Sheeps	20	223		63	70		230
Horses	200	7				1	8
Mares	200	5					5
Colts	100	3					4
Donkeys	150	7					7
She-Mules	150	2					2
Total Weight (kg)		268430	5130	56835			339080
(kg/ha)		229	4.4	48.5			289.3
Mean Stock (kg/ha)*[3]							259.2
Dead+Sold (kg/ha/day)			0.1				

*[1] Weights of sold and purchased cattle are measured weights. Other weights are estimates, attained by multiplying mean weights by the number of animals. At the end of the survey period, one bull purchased from Harayashiki weighed 360 kg, and 5 bulls purchased from Takahashi weighed 2110 kg (data incorporated into Final Weight).

*[2] Harayashiki: 530 heads X 300 kg X 4 months/12 months = 53000 kg, and Ōnuki: 66 heads X 300kg = 19800 kg (Initial), and 66 heads X 300 kg + 4 heads X 250 kg + 52 heads X 120 kg = 27040 kg (Final) were grazed on the Nippaki Ranch.

*[3] (Adjusted Initial Weight + Adjusted Final Weight) ÷ 2

*[4] 25 leased hectares were excluded.

of 1996 (R$ 2,544 rent for 4 months). Ōnuki ran 66 cows on the Nippaki Ranch for an entire year (R$ 1,727 rent for 12 months), with their 56 calves born during this survey period. All of these calves survived, and four of them attained 8 months of age (i.e. the new garrotes and heifers of the year). These animals' dry weights were assumed to be 35 percent of their fresh weight. Thus, the biomass of domestic animals was estimated to be 95.1 kg/ha (3.0 percent of grass biomass) on the Harayashiki Farm, 74.1 kg/ha (4.6 percent ditto) on the Ōnuki Farm, and 90.7 kg/ha (2.9 percent ditto) on the Takahashi Farm.

Related Studies

Other agroforestry and pasture ecosystem biomass data from this region are available for comparison (Table K-10).

Table K-10. Comparative agroforestry and pasture ecosystem biomass data in preceding studies from this region

Author / Publication	Research Site	System	Species	Age*[1]	Plant (#/ha)	Biomass (t/ha)
Teixeira & Bastos / 1989	Manaus	Pasture	*Brachiaria humidicola*	7		4.0
Subler / 1993	Tomé-Açu (Itō, J. Farm)	P. Fruit	*Passiflora edulis*	3	800	3.7
			Theobroma grandiflorum	3	392	0.8
			floor vegetation*[2]			0.3
Subler / 1993	Tomé-Açu (Itō, J. Farm)	B.Pepper	*Piper nigrum*	10	1280	7.9
			Hevea brasiliensis	9	512	42.4
			Theobroma cacao	4 or 5	124	0.3
			floor vegetation*[2]			< 0.1
Subler / 1993	Tomé-Açu (Itō, J. Farm)	Cacao	*Theobroma cacao*	15	708	17.7
			timber trees*[3]	6 to 14	136	55.3
			floor vegetation*[2]			< 0.1
Teixeira et al. / 1994	Capitão Poço	Cacao	*Theobroma cacao*	15	960	29.2
			Hevea brasiliensis	15	140	46.4

*[1] Supplemental planting continued for several years to replace dead plants. Subler (1993) recorded 6-7 years of

Table K-10 -- continued
repeat plating of black pepper plants in fields on J. Itō Farm. Hence, a field would include plants of mixed ages.
*[2] not included in this author's survey, being considered as weed biomass regularly removed by farmers.
*[3] Overstory trees in the cacao field studied were: 14 year-old cedro branco (*Cedrela huberi*), 13 year-old andiroba (*Carapa guianensis*), 13 year-old freijó (*Cordia goeldiana*), 12 year-old mahogany (*Swietenia macrophylla*), and 6 year-old brazilnut (*Bertholletia excelsa*).

Overall results are summarized in Figure K-3.

Reference:

Balick, M.J. and Anderson, A.B. 1987. Dry Matter Allocation in *Jessenia bataua* (Palmae): Acta Amazonica 16/17. p135-140.

Satoo, T. 1982. Forest Biomass (translated from Satō, T. Rikujō Shokubutsu Gunraku no Busshitsu Seisan - Shinrin) [edited and revised by Madgwick, H.A.I.]. viii. 152p. M.Nijhoff/Dr.W.Junk Publishers, The Hague, Netherlands.

Subler, S. 1993. Mechanisms of Nutrient Retention and Recycling in a Chronosequence of Amazonian Agroforestry Systems: Comparisons with Natural Forest Ecosystems. xiv. 203p. Ph.D. Dissertation. The Pennsylvania State University

Teixeira, L.B. and Bastos, J.B. 1989. Nutrientes nos Solos de Floresta Primária e Pastagem de *Brachiaria humidicola* na Amazônia Central (Nutrients in the Soil of Primary Forest and *Brachiaria humidicola* Pasture in the Central Amazon). 31p. EMBRAPA-CPATU (Boletim de Pesquisa 98), Belém, Brazil.

Teixeira, L.B.; Bastos, J.B. and Oliveira, R.F.de. 1994. Biomassa Vegetal em Agroecossistema de Seringueira Consorciada com Cacaueiro no Nordeste Paraense (Agroecosystem Vegetal Biomass of Mix-Planted Rubber Tree and Cacao in Northeastern Pará State). 15p. EMBRAPA-CPATU (Boletim de Pesquisa 153), Belém, Brazil.

Uhl, C; Buschbacher, R and Serrão, E.A.S. 1988. Abandoned Pastures in Eastern Amazonia. I. Patterns of Plant Succession: Journal of Ecology 76. p.663-681.

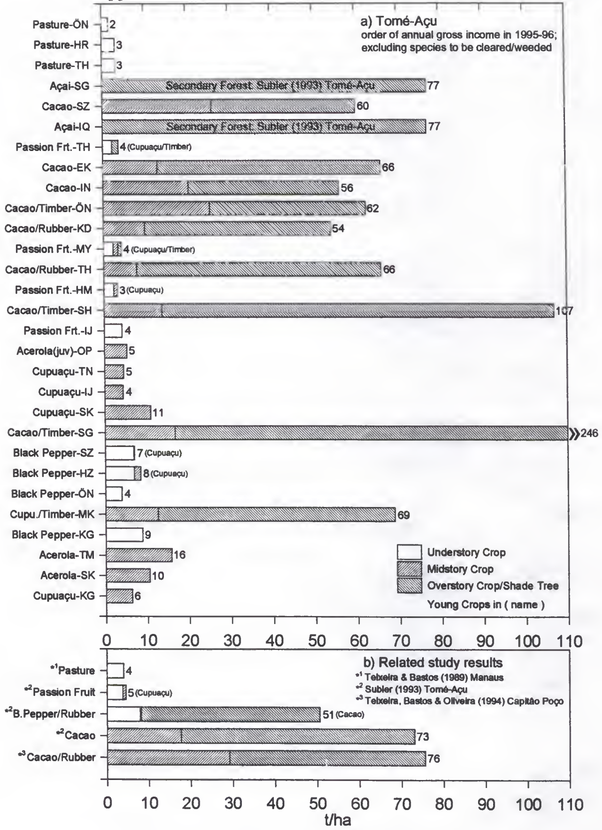


Figure K-3. Agroecosystem biomass at Tomé-Açu

APPENDIX L
PHOTOGRAPHS OF JAPANESE-BRAZILIAN AGROFORESTRY AT TOMÉ-AÇU (1995-96)

Figure L-1 (Taketa Farm, Boa Vista Lot No. 24)

A typical Japanese-Brazilian farm has a homegarden (1-3 ha) close to the owner's house. Around the homegarden, Mr. Taketa has a farm forest reserve (back). He extracted wood there to construct his house in the 1950s, when chainsaws were not yet available. Hence, he left the most dense species of the primary forest standing, including a large ipê roxo tree.

Figure L-2 (Sasaki Farm, Breu 3-7 Lot No. 325)

A farm nursery (both crop and tree species) is prepared in the frontyard. Palm leaves and synthetic cheesecloth are used for shading. Between the rows of black pepper cuttings, Mr. Sasaki grows teak tree seedlings. He will intercrop teak with black pepper and passionfruit.

Figure L-3 (Sasaki Farm, Breu 3-7 Lot No. 326)

Black pepper and passionfruit are planted simultaneously. This site was a fallow grassland before. Organic and chemical fertilizers, and charcoal (black fragments) are mixed and put into the planting pits.

Figure L-4 (Konagano Farm, Breu 3-7 Lot No. 177)

Black pepper and passionfruit (both in the 1st year after planting) are growing together. In this field, lightning struck the wire supporting the passionfruit. While passionfruit vines quickly recovered from the damage, black pepper vines died back and still look weak (front). Drip irrigation is installed, and a leguminous green manure species is planted between the rows.

Figure L-5 (Miyagawa Farm, Breu 4-6 Lot No. 460)

This was formerly a black pepper field. When the vines died from *Fusarium*, a *nisei* farmer, Mr. Miyagawa, planted passionfruit with brazilnut and cupuaçu seedlings. After two successive passionfruit croppings (6 years), the intercropped young trees are taking over the field. Mr. Miyagawa will remove the dead passionfruit vines soon, and reuse the stakes and wire in other fields.

Figure L-6 (Takaki Farm, Breu 3-7 Lots No. 516 to 528)

A 14 ha, 25-year-old orchard of brazilnut (580 trees), cacao, eritrina, and palheiteira was planted by a *nisei* farmer, Mr. Kondō, in 1971. After his death, another *nisei* farmer, Mr. Takaki, purchased the lots. Compare the orchard with the 6-month-old passionfruit field in the foreground.

Figure L-7 (Takaki Farm, Breu 3-7 Lots No. 516 to 528)

Inside the brazilnut-cacao orchard of Figure L-6. The litter layer is about 20 cm deep. Weeds are suppressed by the tree shade, and there is little need for clearing and weeding.

Figure L-8 (Sasahara Farm, Ipiranga Lot No. 1-07)

Mr. Sasahara planted cacao, cupuaçu, mahogany, freijó, brazilnut, andiroba, rubber tree, bacuri, macacauba, and other MPTs together. About 12 ha of his farm look like this photograph. Most trees were planted after 1980.

Figure L-9 (Takaki Farm, Breu 4-6 Lot No. 461)

An 8.5 ha agroforestry field based on rubber trees planted in 1984 (see the black tapping cup on a tree). The intercropped species are cacao, coffee, cupuaçu, freijó, bacuri, brazilnut, andiroba, and cedro branco (visitors are inspecting a young branch). The plantation forest floor is covered by pueraria, which was also planted by Mr. Takaki.

Figure L-10 (Wada Farm, Breu 5-8 Lots No. 55 and 56)

Mr. Wada experimentally planted paricá trees in 1983 on his cacao field (2.5 ha) shaded by eritrina and palheiteira. The 50 paricá trees (13 years old) have reached 30-40 m in height, and 50-70 cm in DBH. The largest of all, this photographed tree, is 40 m in height and 80 cm in DBH. Mr. Wada (left) receives a visit by the vice president of ***Eidai do Brasil Madeiras S.A.*** (center) and his reforestation crew.

Figure L-11 (Sasaki Farm, Breu 3-7 Lot No. 325)

Mr. Sasaki and his farm laborers are separating black pepper grains from stalks.

Figure L-12 (Ōnuki Farm, Ipiranga Lot No. 1-17)

The fermented cacao seeds are dried in the sun. A 16 ha cacao field is in the background, shaded by freijó, brazilnut, macacauba, andiroba, mahogany, cedro vermelho and other MPTs.

Figure L-13 (Takahashi Farm, Ipiranga Lot No. 1-20)

Figure L-14 (Koshōji Farm, Breu 5-8 Lot No. 57)

Appendix L--continued

Figure L-1. A typical Japanese-Brazilian farm at Tomé-Açu

Figure L-2. A Japanese-Brazilian farm nursery

Appendix L--continued

Figure L-3. Crop sequence begins

Figure L-4. Young vine crops and green manure plant

Appendix L--continued

Figure L-5. Succession from vine crops to tree crops

Figure L-6. A mature orchard of brazilnut and cacao (back)

Appendix L--continued

Figure L-7. Inside the mature brazilnut/cacao orchard

Figure L-8. Intercropped cacao and mahogany

Appendix L--continued

Figure L-9. Agroforestry of multiple plant species

Figure L-10. Paricá for shading cacao orchard

Figure L-11. Black pepper harvested

Figure L-12. Drying cacao seeds

Appendix L--continued

Figure L-13. Cupuaçu fruits

Figure L-14. A soursop (graviola) fruit

APPENDIX M

JAPANESE YEN EXCANGE RATE VERSUS THE US DOLLAR, 1874-1997

Year	Index	Year	Index	Year	Index	Year	Index
1874	0.98	1905	2.01-2.04	1936	3.45	1967	361.91
1875	1.01	1906	2.02-2.03	1937	3.47	1968	357.7
1876	1.05	1907	2.02-2.03	1938	3.51	1969	357.8
1877	1.04	1908	2.02-2.03	1939	3.85	1970	357.65
1878	1.09	1909	2.02-2.03	1940	4.27	1971	314.8
1879	1.13	1910	2.02-2.03	1941	4.27	1972	302
1880	1.05-1.12	1911	2.03-2.03	1942	-	1973	271.07
1881	1.10-1.13	1912	2.02-2.03	1943	-	1974	292.35
1882	1.08-1.14	1913	2.02-2.04	1944	-	1975	297.26
1883	1.09-1.14	1914	2.03	1945	-	1976	296.25
1884	1.10-1.16	1915	2.05	1946	-	1977	266.93
1885	1.15-1.22	1916	2	1947	-	1978	207.87
1886	1.22-1.37	1917	1.98	1948	-	1979	221.38
1887	1.25-1.37	1918	1.95	1949	-	1980	225.78
1888	1.31-1.38	1919	1.98	1950	361.05	1981	221.46
1889	1.27-1.36	1920	2.02	1951	361.05	1982	249.94
1890	1.08-1.34	1921	2.08	1952	361.05	1983	237.8
1891	1.18-1.33	1922	2.09	1953	360.8	1984	238.67
1892	1.33-1.53	1923	2.05	1954	360.8	1985	235.07
1893	1.49-1.83	1924	2.38	1955	360.8	1986	167.04
1894	1.82-1.75	1925	2.45	1956	360.8	1987	142.72
1895	1.83-2.14	1926	2.13	1957	359.66	1988	128.01
1896	1.92-2.02	1927	2.11	1958	359.7	1989	138.2
1897	1.94-2.08	1928	2.15	1959	359.2	1990	145.14
1898	2.02-2.06	1929	2.17	1960	358.3	1991	134.29
1899	2.00-2.03	1930	2.03	1961	361.77	1992	126.51
1900	2.02-2.04	1931	2.05	1962	358.2	1993	110.53
1901	2.02-2.04	1932	3.56	1963	361.95	1994	101.39
1902	2.00-2.03	1933	3.96	1964	358.3	1995	93.83
1903	2.00-2.04	1934	3.39	1965	360.9	1996	109.18
1904	2.03-2.06	1935	3.5	1966	362.47	1997	121.76

Appendix M--continued
Source: 1874-1965: Bank of Japan (1966), 1966-72: Bank of Japan (1977, 1978), and 1973-97: Bank of Japan (1998)
Note: 1874-79 and 1914-41 exchange rates were calculated from original tables listing US$/JP¥ 100 average rates. During 1880-1913, only US$/JP¥ 100 ranges were provided. 1874-79 quotations were derived from a Demand Draft (D/D) from Yokohama. 1880-August 1896 quotations were derived from a D/D of the Yokohama Specie Bank (*Yokohama Shōkin Ginkō*). September 1896-November 1931 quotations were derived from Telegraphic Transfer (T/T) selling rates of the Yokohama Specie Bank. December 1931 quotation was a commercial rate. 1932-41 quotations were commercial T/T rates investigated by the Yokohama Specie Bank. 1950-56 quotations were official T/T rates. 1957-72 quotations were inter-bank Tokyo spot middle rates at the end of each year. 1973-97 quotations were 12 month averages of inter-bank Tokyo spot closing rates at the end of each month. The Basic Rates used were US$ 1 = JP¥ 360 during the 1950-70 period, and US$ 1 = JP¥ 308 during 1971-77 period.

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APPENDIX N
PORTUGUESE AND JAPANESE ABSTRACTS

RESUMO

Os Sistemas Agroflorestais Nipo-Brasileiros na Amazônia
Um Caso de Desenvolvimento Rural Sustentavel no
Trópico Úmido

por

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Maio de 1999

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A pesquisa focalizou as atividades agricolas de uma comunidade nipo-brasileira na Amazônia. A história de noventa anos de imigração desta comunidade foi discutida no contexto da economia e politica internacional. Foram investigadas as estratégias coletivas de sobrevivencia destes imigrantes no interior da Amazônia, e os instrumentos de apoio oferecidos a estes produtores rurais pelos governos Brasileiro e Japonês. Foram examinados os processos de identificação de espécies adequadas ao solo e clima local, da diversificação agrícola, e do desenvolvimento

agroflorestal, assim como foram discutidas as perspectivas para a agricultura nipo-brasileira nesta região.

As pesquisas de fontes secundárias foram realizadas nos EUA, Japão e Brasil (em São Paulo e na Amazônia), entre 1992 e 1998. Pesquisas no campo foram conduzidas durante maio a junho de 1993, e entre dezembro de 1994 a janeiro de 1997. O município de Tomé-Açu, por possuir a mais numerosa colônia japonesa na Amazônia desde 1929, foi escolhido neste estudo de caso.

A população nipo-brasileira de Tomé-Açu (1.500 pessoas) foi investigada em sua totalidade para a determinação das características socio-econômicas do grupo, e das modalidades de uso de suas propriedades (numa área total de 78.500 hectares). Para cada estabelecimento rural foi desenvolvido um inventário de espécies cultivadas e animais criados, assim como sobre a idade das plantas, quantidades plantadas e existentes, áreas de cultivo e sistemas de plantio. Os sistemas agrícolas representativos dos agricultores nipo-brasileiros em Tomé-Açu foram estudados através dos registros financeiros de 29 campos durante o ano agricola de 1995-96. Estes sistemas incluiram açai, acerola, pimenta-do-reino, cacau, cupuaçu, maracujá, pastagem, seringueira, e espécies madeireiras.

A pesquisa concluiu que sistemas agroflorestais são mais eficientes em termos de geração de renda e conservação de recursos naturais, quando comparados com o sistema que mais tem se expandido recentemente, baseado na expansão de pastagens. Areas de dez a vinte hectares em sistemas agroflorestais geraram renda similar aquela gerada por fazendas de gado com centenas ou até mesmo acima de mil hectares de pastagens. Comparados as fazendas de gado, os campos agroflorestais geraram mais empregos rurais por unidade de área (hectares), especialmente para mulheres e menores. Sistemas agroflorestais tendem a constituirem-se numa alternativa economicamente viável e ecologicamente mais preferível do que o sistema pastoril. Contudo, ainda existem vários obstáculos impedindo o desenvolvimento de sistemas agroflorestais.

Estas experiências de produtores nipo-brasileiros na Amazônia oferecem lições para o desenvolvimento rural sustentável na região, e no trópico úmido mundial.

ブラジルアマゾンの日系人アグロフォレストリー
湿潤熱帯における持続的農業開発の事例研究

山田祐彰

１９９９年　５月

指導教授　ヘンリー・ルイス・ゴルツ
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本研究は、ブラジルアマゾンにおける日系人農業活動に関する一考察です。まず、９０年に及ぶ同地域への日本人移民を、国際政治経済的視点から検討します。アマゾン奥地に適応するための移住者集団の自助努力と、日伯両国政府の対応について論じます。また、適正作物の選択、農業経営の多角化、及び、アグロフォレストリーの開発過程を検証し、日系農業の将来を展望します。

文献資料収集は日伯米３カ国において、１９９２年から１９９８年まで行ないました。フィールド調査は１９９３年５－６月、及び、１９９４年１２月－１９９７年１月に実施しました。事例研究対象は、アマゾン最大かつ二番目に古い日系移住地トメ・アスー郡を選択しました。

同郡内の全日系人（１５００人）について、その社会経済的特徴と、所有地（７８５００ヘクタール）利用実態を把握するため訪問調査を行ないました。また、各農家の作物作付年度、本数、面積、及び作付方法を調べました。日系農家の代表的生産システム２９事例について、１年間の経営を記録しました。作物として、アサイー椰子、アセローラ、胡椒、カカオ、クプアスー、果物時計草、牧草（家畜）、パラゴム、用材樹種が含まれます。

その結果、耕種作物による生産システムの方が、近年拡大しつつある牧場生産システムよりも、農家収入及び天然資源保全の上でより効率的であることが明らかになりました。１０－２０ヘクタールの耕種農場と、数百－千数百ヘクタールの牧場が、ほぼ同程度の収入を上げていました。耕種農場は牧場に比べ単位面積あたりより多くの農村雇用を創出し、婦女子にも収入の機会を与え、地域社会の安定に貢献していました。樹木を含む、耕種作物の時空間的複合によって形成されるアグロフォレストリーは、経済的に実現可能な、また牧場に比べ生態的により望ましい生産システムであることがわかりました。しかし、その発展を阻害する多くの要因も見出されました。

ブラジルアマゾンにおける日系人の経験は世界の湿潤熱帯地域の持続的開発の上で、貴重な教訓を与えるものと思われます。

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Notes: A separate reference list is provided for each chapter. Unpublished interview records in Japanese are available upon request to this author: Masaaki Yamada, 104 Takasuka, Tsukuba-shi, Ibaraki-ken 300-2665, Japan.

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Chapter 4

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BIOGRAPHICAL SKETCH

Masaaki Yamada was born in Mitsukaidō City, Ibaraki Prefecture on July 1, 1964. He was grown at Takasuka, a hamlet surrounded by pine forests, upland fields and rice paddies. He attended public schools at Yatabe Town (today's Tsukuba City) and Tsuchiura City. In 1989, he graduated from the University of Tokyo with Bachelor and Master of Agriculture. He worked for the Japanese NGO Center for International Cooperation - JANIC, in charge of Appropriate Technology Program until 1992. He engaged in research and publication, and coordination of international symposiums and training programs. This work included trips to the Philippines, Thailand, Malaysia, Indonesia, and all over Japan. Among others, Yamada was inspired by JANIC's technical cooperation project on efficient production and multi-purpose utilization of charcoal in West Kalimantan, Borneo Island. At this opportunity, he encountered local NGO Dian Tama, dedicated for agroforestry development and rural income generation. Working together with Indonesian volunteers, Yamada decided to study agroforestry. Masaaki Yamada is married to Helena Sayuri Yamada, a Brazilian of Japanese extraction, whom he met at Tomé-Açu. They have one child, Elma Yukari Tsukimata Yamada, born in 1997.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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Marianne Schmink

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May, 1999

Wayne H. Smith

Director, Forest Resources and Conservation

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